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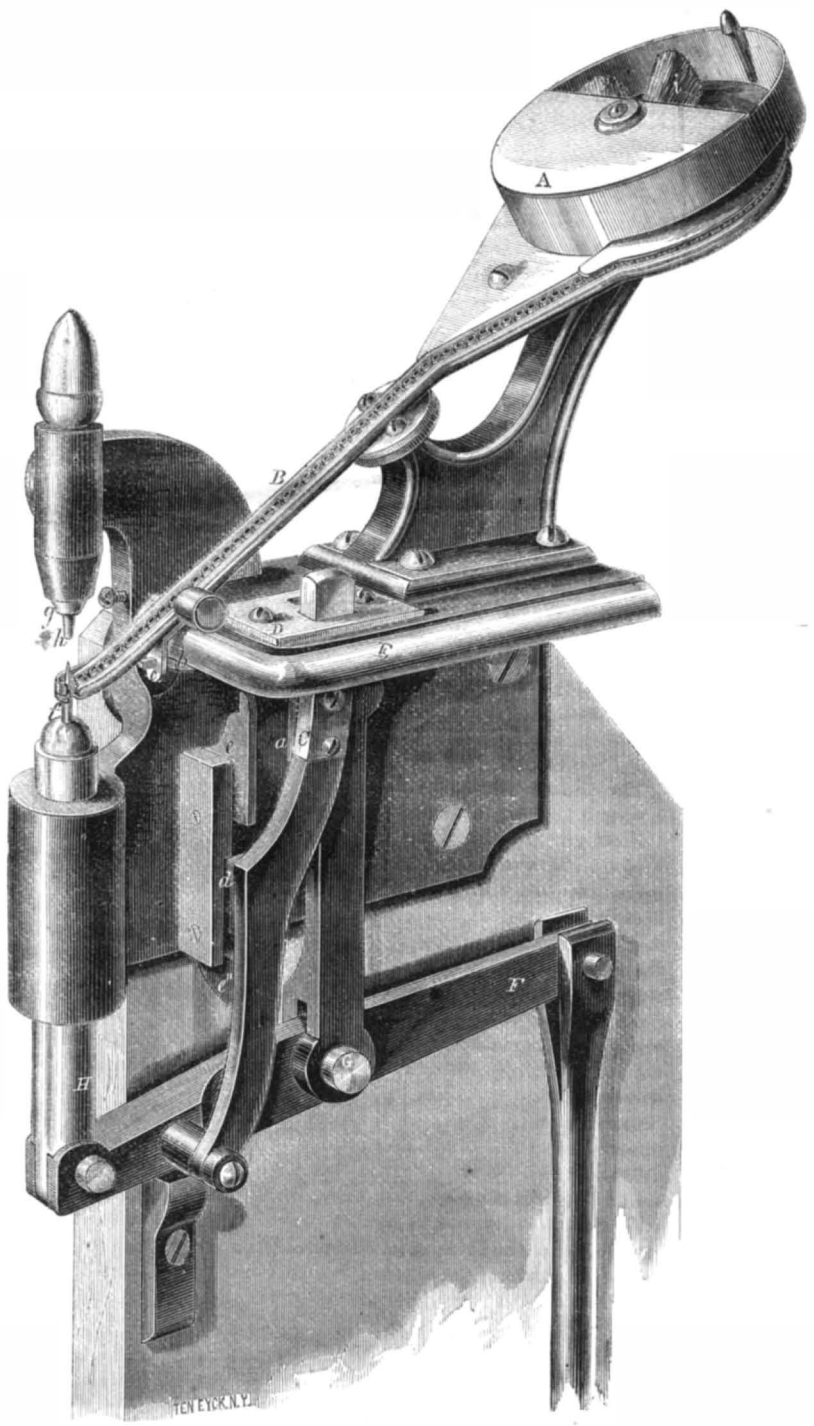
Eyeleting Machine.

The operation of inserting eyelets into garments and shoes, in fact into anything in which their presence is required, is a very simple one; but the number of them which are used calls for the introduction of machinery, as by this means they can be fed down and inserted much more speedily than by hand labor. The accompanying engraving illustrates a machine of this character, the details of which we hope to make plain to our readers. The brass box, A, has a center fixed in the trough, B, on which it vibrates. In connection with this trough is the bar, C, working through a slot in the plate, D; this bar has a wedge-like projection *a*, upon the back of it which works against the plate, *b*, upon the under side of the table, E. One end of this plate is jointed, and the other is inserted in a lug, *c*, on the trough, B, beforementioned, in the manner clearly shown by our engraving. The horizontal lever, F, works upon the fulcrum, G, and carries at its extreme end the plunger, H; upon this lever, also, is the joint which works in the bar, C; attached to the lower part of the latter is the piece, *d*; this piece strikes against the slotted plate, *e*, in its upward passage, and throws it into communication with the plate *b*; it is disengaged by the return of the bar striking on the projection, *e''*. This arrangement keeps the trough on one side while the eyelet is being closed in the work. The plunger, H, has a small pointed wire, *f*, in its top provided with a spring; as the eyelets descend the groove they are taken on to this wire and carried up against the stationary head, *g*, the wire in this operation being guided by the hollow spindle, *h*. The box, A, has a brush, *i*, which oscillates in it by means of a small crank and shaft on the under side, which cannot be shown in our view of the invention. These comprise the main features of the machine. The operation of it is very simple, and it can be easily managed by any girl or boy. When power is applied to the lever, F, the plunger receives an upward thrust. The same agency also pushes to one side the trough and allows the plunger to work uninterruptedly against the stationary head, thereby closing up the eyelet by the blow. Upon the return of the plunger the trough also being released by the projection, *e''*, swings back to its place and allows the eyelet to descend again upon the wire. These operations are repeated as often and as long as may be desired. There is a cover provided for the box, A, which we have removed in order to show the interior.



REED & PACKARD'S EYELETING MACHINE.

The patent for this invention was procured through the Scientific American Patent Agency, July 22, 1862, by Messrs. Reed & Packard, of Bridgewater, Mass. An application for a patent has also been made in England. Further information can be had by addressing C. E. Howard, agent, West Bridgewater, Mass.

THE NEW ATLANTIC TELEGRAPH.

On the 5th inst., Cyrus W. Field arrived in this city by the steamer *Asia* from Europe, he having visited England for the purpose of furthering measures respecting another effort to lay a new telegraphic cable in the Atlantic. On the day before the *Asia* sailed, a large meeting was held at Liverpool, presided over by Mr. Wm. Brown; and Mr. Field explained the condition of the Atlantic Telegraph Company and its prospects. Speeches, hopeful in tone, were also made by Mr. Brown, Mr. Bushell and other gentlemen, and resolutions were adopted expressing faith in the ultimate success of the undertaking, and pledging the meeting (individually and collectively) to do all in its power to bring about that success. An extraordinary meeting of the Atlantic Telegraph Company was held in London on the first week of December last, at which the Right Hon. Stuart Wortley presided. He stated that the accidents which had hitherto occurred to submarine cables had invariably taken place in shallow water. There had not been a cent expended for repairs upon any of the telegraphic lines that had been laid in deep water. The whole of the new Atlantic cable, except the shore ends near the Irish and Newfoundland coasts, would be in deep water, and little danger of injury was to be apprehended, if a good cable was properly laid. Mr. Wortley condemned the manner in which the first Atlantic cable was constructed and laid. He said he was in possession of facts which accounted satisfactorily for the failure of that cable. It was illy constructed, hastily laid, and unfit to be let down into the bottom of the sea. The capital required for the next cable was £600,000 (about 3,000,000), and it was proposed to raise it by the issuing of five-pound shares. If the cable was successful, the British Government would guarantee eight per cent to the shareholders. About one-sixth of the capital required has been already subscribed, and it is believed the whole amount will be raised before the month of May. It should not be forgotten that President Lincoln in his message said: "I have favored the project for connecting the United States

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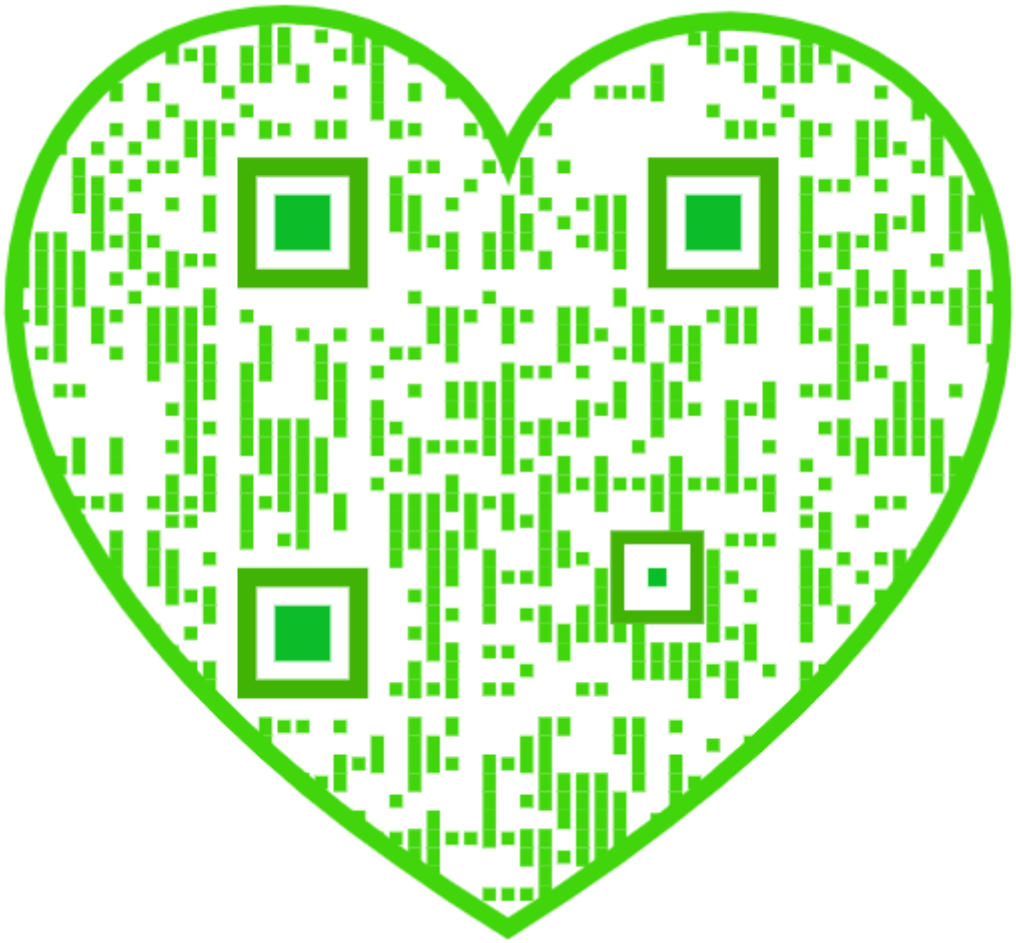

with Europe by an Atlantic telegraph, and a similar project to extend the telegraph from San Francisco to connect by a Pacific telegraph with the wire which is being extended to the Russian empire. Our continent is now belted with the electric wire, and it is not too much to hope for, that a cable may be laid in the Atlantic and another in the Pacific before this year closes; thus encirling the globe with a telegraphic highway.

THE FALSIFICATIONS OF ALCOHOL.

We translate from a French scientific journal, *L'Invention*, some accounts of the production and falsifications of alcohol.

Alcohol, as we all know, is the product of the distillation of sweet liquors; we draw it by the distil lation of wine, of cider, of beer, and all liquids which have undergone alcoholic fermentation. The wines which are gathered in France are not all destined to be consumed in nature. A part of the wines of the Meridian, from raisins (meaning grapes) rich in sugar, are converted into alcohol by distillation. We choose generally the white wines, which do not contain more alcohol than the red wines, but which furnish one more fine and straight in taste; the alcohol which comes from the fermentation of raisins is ordinarily impure. It contains an essential oil which gives it in some cases an agreeable savor, in others a taste disagreeable. One can at least detect the presence of this oil in the alcohol of wine not rectified. In spreading the liquor with six parts of water and distilling it with precaution, it remains in the *cornue*, an oily layer. This oil is very abundunt in the brandies which come out of the *marc* of the vintage; it is produced principally by the pellicles of the grain; one hundred litres of alcohol, separated, contains twenty grammes of this oily matter formed of the oil of the potato, of oily fat; of which a single drop suffices to infect one hundred litres of brandy. One can separate this oil of alcohol by a distilling pipe with management; in fact, the alcohol drinks at about eighty degrees, and the oil in question does not enter into ebullition, but between one hundred and thirty and two hundred degrees. The wines of the Dauphin and of the Vivarais of the Moselle give the alcohol which participates of the taste of *terroir*, that characterizes these wines.

It is probably to circumstances of this nature to which we must attribute the taste and *bouquet* in the old eau-de-vie de cogniac. During a long time brandy has been obtained through distillation by a naked pipe; unless one operates on white wine of a good quality, it is rare that we obtain an alcohol exempt from the taste of *marc*, or fire, contracted through this mode of distillation. The idea of substituting another mode for the one just mentioned belongs to Argand, the inventor of the lamp with a double current of air, *de quinquet*. The processes of Argand were perfected by Edward Adams, who operated with an apparatus of De Wolf's, in which the flasks filled with wine were heated by steam. One concedes that with this system, each flask, when unequally heated, gives an alcohol of different degrees. The processes of Adams were notably perfected by M. Blumenthal, who had recourse to a continuous mode of distillation, and knew how to combine the apparatus in such a manner that even during the drainage of the wines the distillation was uninterrupted. The wine arrives upon one side, while that which preceded it comes over upon the other, after having parted with the whole alcohol which it contained. This apparatus has, since M. Blumenthal, been perfected by M. Derosne, who prevented the depuration of some of the alcohol in the draining of the wines. This last perfection was till more simplified by M. Langier. In submitting brandies to a new rectification, one obtains alcohol of three-sixths de Montpellier; it marks thirty-three degrees by the alcometer. The alcohol is received in vats, in which a part of the coloring matter is dissolved; this coloration becomes apparent as the sojourn of these liquids in barrels is prolonged. One is then disposed to allow more quality and *vetuscity* to brandies which are colored. Commerce sometime cuts the three-sixths of Montpellier with water, and colors it with an infusion of Caramel dissolved in tea, which seems to give this new brandy a taste of *vetuste*, but it is rare that this falsification escapes an experienced taster.

Wine is not the only substance from which alcohol is obtained; the beet, grain, potato, certain fruits, such as chestnuts, cherries, etc., produce alcohol of a good quality of which different kinds are consumed in brandy. Brandies are mixtures of alcohol and water, and contain about equal parts of both liquids; spirits, in commerce, is an alcohol which contains less water than brandy. The richness of a spirit is always determined by the real quantity of alcohol which it contains; it is not the same with brandy, its color is not always proportionate to the quality of alcohol which it contains, more frequently it depends upon its age and growth. Experiments were at one time tried upon the spirits of commerce, by pouring it upon powder and then inflaming it, when the powder burned the spirit was judged to be of a strong quality; this is, however, no accurate test.

In France, the legal alcometer is that of Gay-Lussac; it expresses immediately the absolute quantity of alcohol which is contained in liquor; the experiment must be made at 15°, if the liquor has not this temperature it must be brought to it by the heat of the hand; for the rest, Gay-Lussac has given tastes of correction, which determine by the aid of the alcometer, the quality of an alcoholic liquid taken at different temperatures. The principal of graduating this instrument is simple; when put into absolute or pure spirit, it is sunk to the point marked 100°, placed in pure distilled water, and it stops at the point zero, the interval between these two points is then divided into 100° by the aid of mixtures of alcohol and water in proportions which are known—this instrument indicates the relations of volume, not of weight. In commerce, Cartier's areometer or liquor-weigher is still employed; in this instrument water which is distilled marks 10°, and alcohol "anhydre" marks 44°. Brandy from wine, originally has a whitish color, but by tarrying in oaken barrels it acquires by age the yellowish-brown coloration which it ordinarily has, and which is due to the dissolution of a part of tannin and the extract contained in the oak. This brandy thus colored is blackened with a few drops of a solution of sulphate of iron. Brandy of a good quality possesses an aromatic odor, and a warm and clear savor, which is modified by time, the most esteemed brands are those of the Languedoc, of Montpellier and the district of Armagnac.

Jewelers' Gold.

The London *Mechanics' Magazine* contains the following interesting remarks on this subject:—

From very ancient times it has been the practice to divide the ounce troy into twenty-four imaginary parts. An ounce of pure gold, therefore, and what is called twenty-four carat gold, are identical terms. Anything less than twenty-four carat gold indicates that in an ounce of that substance there are so many twenty-fourth parts of gold, and that the remaining portions of an ounce of it is made up of an alloy of some inferior metal, usually copper. Except for wedding rings, which are, or should be, made of standard gold, consisting of twenty-two parts or carats of pure gold, and two of copper alloy, jewelers seldom use gold of a higher rate of purity than eighteen-carat. How often they use it of a much lower degree of fineness they know best. There is no doubt that it is possible to give almost any color to gold, by the addition of particular alloys; and of late ingenuity has been at work to give the sixteen-carat gold the appearance of pure gold. This is done by the aid, partly, of what is technically known as the coloring pot, in which the metal is treated to an acid bath of a certain amount of strength. By the judicious use of this contrivance, twenty-two carat gold may be made to resemble very closely native gold, as found in the shape of nuggets in California or Austrialia. Nuggets are never, however, found to be pure gold—they consist for the most part of about twenty-three carat gold, the fraction being made up of an alloy of some inferior metal. In order to test the purity of gold the application of heat is, perhaps, one of the simplest means. Pure gold will not be in the least discolored by it, while twenty-three carat gold will take a slightly red tint. There is this disadvantage about the mode of testing suggested, it will certainly discolor very materially all gold of degrees of fineness inferior to that of twenty-three carat, and nothing but the acid bath will restore it to its original hue. In order to effect this latter operation on a small scale, nothing more is necessary than to obtain an earthen pipkin or gallipot, place the article in it, cover it with nitric acid, and hold it over a spirit or gas lamp, or even a candle, until the acid boils. The result will be that the metal will be restored to its original brightness.

As regards the testing of the genuineness of gold coin, there is nothing equal in simplicity or efficacy to weighing it. It is impossible that any metal inferior to standard gold can be used in the manufacture of counterfeit sovereigns or half sovereigns which will give pieces, of the same size, of equal weight.

The testing of "jewelers' gold," when used in the manufacture of many kinds of trinkets, is a matter attended with considerable risk and difficulty; and perhaps the only means readily at the command of the purchaser, for insuring a proper relationship between quality and price in such cases, is to ascertain the respectability of the seller.

Cochineal Superseded.

As everybody knows, the various shades of scarlet and crimson with which textile fabrics are dyed or printed were made from cochineal. Cochineal is an insect taken in Mexico, from the broad leaves of the cactus. Ordinarily it would now command an enormous price. It is worth less even now than it was ten years ago. The cause of this decline in value of cochineal is because of the discovery of a more beautiful dye, called analine, produced from our native coal oil. From this coal oil, by tedious process, is produced this analine, of which, by the way, a single pound costs eighty dollars. Its diffusiveness, we believe, exceeds that of any known substance. A pound of it would impart a perceptible tint to a large pond of water. At a factory, the other day, where silk handkerchiefs are printed, we had an opportunity of observing the incomparable superiority of the new colors to those produced by cochineal. Analine gives every shade of purple, from the deepest royal to the faint lilac, every variety of blue, from the pale tint of the sky to the deepest ultramarine, and all the gradations of scarlet and crimson of like beauty. Coal oil, that in its crude state is as dangerous as gunpowder and as offensive to the senses as the odor of a pole-cat, is one of the greatest innovations of modern times.—*United States Gazette.*

[The inference might be drawn from the above, that analine colors were obtained from the crude oils of the Pennsylvania oil wells, whereas petroleum is devoid of true benzole, which is the main substance that produces analine. Benzole is a product of the tar obtained by the distillation of coal, and an abundance of this substance may be obtained from the tar of all the city gas-works. So far as we know, however, there is not a manufactory of analine colors in this country—these beautiful dyes are all imported from France and England. Dyers, while admitting the beauty of aniline red colors, still consider those derived from cochineal superior in withstanding the action of sunlight without fading.—EDS.

Curing Meats.

An exchange, says a French chemist, has lately asserted that scurvy will never arise from the use of salt provisions, unless saltpeter be used in curing; the salt alone answers all the purposes, provided the animal heat be entirely parted with before salting. He claims that the insertion of pork in pickle alone is not sufficient, but that it should be rubbed thoroughly with dry salt after it has entirely parted with its animal heat, and that then the fluid running from the meat should be poured off before packing the pork in the barrel. This should be done sufficiently close to admit no unnecessary quantity of air, and some dry salt should occupy the space between the pieces, and then pickle, and not water, should be added. Great care must be taken to fill the barrel entirely full, so that no portion of the meat can at any point project above the surface of the fluid; for, if this occurs, a change of flavor ensues such as is known with rusty pork. The pickle, of course, must be a saturated solution of salt and water, that is, so strong that it is incapable of dissolving more salt. It must be remembered that cold water is capable of dissolving more salt than hot water.

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The Wonders of the Globe.

In a recent editorial article in the SCIENTIFIC AMERICAN, it was asserted that as the mineral suplies of the world were exhausted, there were others accumulating which would supply their places. In support of this assertion we subjoin some extracts cut from our exchanges :—

IRON FORMED BY ANIMALCULES.—The *Journal de l' Instruction Publique* contains a curious article by M. Oscar de Watterville, in which he announces the fact, not generally known, that in the lakes of Sweden there are vast layers or banks of iron, exclusively built by animalcules, not unlike those that have laid the foundations of large islands in the ocean, by silently and for ages cementing matter with matter, so as to create those beautiful forms known as madreporæ, mille-poræ, corals, &c. The iron thus found is called in Sweden "lake ore," distinguished, according to its form, into gunpowder, pearl, money, or cake ore. These iron banks are from ten to two hundred meters in length, from five to fifteen meters broad, and from a fourth to three-fourths of a meter in thickness. In winter, the Swedish peasant, who has but little to do in that season, makes holes in the ice of a lake, and with a long pole probes the bottom until he has found an iron bank. An iron sieve is then let down, and with a sort of ladle, conveniently fashioned for the purpose, the loose ore is shoveled into the sieve, which is then hoisted up again. The ore thus extracted is of course mixed with a quantity of sand and other extraneous matter, which is got rid of by washing it in a cradle like that used by gold-diggers.

AN ISLAND OF SALT.—The salt-works that Com. Buchanan attempted to destroy at Petit Anse, Western Louisiana, proved to be only a storehouse for rock salt, which constitutes almost the bulk of the island. The discovery of this remarkable salt-mine has only recently been made. The immense value of this mine of wealth can scarcely be realized. A million dollars was offered to its owner by a company of persons in the neighborhood, but refused. This island of salt—possibly three or four miles long and one wide, of irregular form, and covered from fifteen to twenty feet with rich soil—bears on its surface immense pecan and live oak trees. Some 500 prisoners and deserters have from time to time come into possession of Com. Buchanan; also large quantities of sugar; also 300 bales of cotton, and some other articles of value.

COAL IN MICHIGAN.—Professor Winchell, State Geologist of Michigan, reports that the whole central area of that State, embracing 187 townships, or 6,700 square miles, is underlaid by coal seams, ranging in thickness from three to five feet. Mines have been opened in several places, three at Jackson and one at Corunna, which last year yielded over 25,000 tuns. The coal resembles that in the Illinois beds in quality.

To Military Critics.

As so many newspaper editors, and also citizens in their parlors, are criticizing some of our generals in the field without mercy, record or fact, we commend to them the timely words of Chas. Kingsley :—

"Battles (as soldiers know and newspaper editors do not) are usually fought, not as they ought to be fought, but as they can be fought; and while the literary man is laying down the law at his desk as to how many troops should move here, and what rivers ought to be crossed there, and where cavalry should have been brought up, and when the flank should have been turned, the wretched man who has to do the work finds the matter settled for him by pestilence, want of shoes, an empty stomach, bad roads, heavy rains, hot suns, and a thousand other stern warriors who never show on paper."—*Exchange.*

THE WEATHER.—Thus far the winter in the Northern States has been mild and salubrious beyond any other within our recollection. The Hudson river is open nearly to Albany, and steamers are now running as freely on it as during the month of November. West of the Hudson there is no snow, and the rivers and creeks have not yet been bound in icy fetters. The Mississippi is open from Quincy in Illinois, and the weather in the West has also been unusually warm.

MISCELLANEOUS SUMMARY.

THE TEMPERATURE OF INCANDESCENT BODIES.—M. Becquerel of Paris, has published the results of some interesting researches upon the determination of high temperatures by means of the intensity of the light emitted by the incandescent bodies. He employed a thermo-electric pyrometer, formed of platinum and palladium wires, united together without soldering for the space of about $\frac{4}{10}$ of an inch. The intensity of the thermo-electric current developed in this pair is very great; it increases with the temperature in a more regular manner, without the unequal variations observed when other metals are employed; this pair is also available to nigh the fusing point of palladium, 2,700°, Fah. By this instrument M. Becquerel ascertained the fusing point of silver to be between 1,710° and 1,730°, and that of gold scarcely 1,962°.

A GREAT CANAL PROJECT.—The Dutch have set on foot a gigantic work of canal improvement. It is proposed to construct a ship canal, from Amsterdam through North Holland towards the sea, to be thirteen miles long, two hundred feet wide, and twenty-four feet deep. This canal will shorten the distance from Amsterdam to London and all ports south of the Texel by about eighty miles, so that vessels will soon be enabled to reach the sea in a few hours, whereas the present journey over the Simluger and the North Holland canal now occupies several days, and sometimes weeks.

YELLOW SPOTS ON LEATHER.—Yellow spots on leather frequently occur, and these detract from its value. A correspondent of the *Shoe and Leather Reporter* says they are caused by decomposition in the hide, probably in the sweating process. The remedy he says is "more care in the manipulation or working of the hides. With good, cold spring water for soaking, and with a sweat-pit kept at the right temperature, with ice or otherwise, and a cool, sweet liquor for the first stages of handling, there is but little danger of being troubled with yellow spots on leather."

THE convention of Western paper manufacturers held their first meeting in Chicago on the 3d ult., and their second on the 23d ult. At the latter there were exhibited several samples of pulp made from straw, corn husks, sorghum and bass-wood. The experiments are to be prosecuted to a more successful test. Messrs. Butler & Hunt, at St. Charles, and Mr. Beardsley, at Elkhart, and two mills at Beloit, Wis., are engaged in efforts to introduce a cheaper article for the manufacturing of paper than rags afford. There are thirty-three paper mills in five of the North western States.

ADVICES from Egpyt state that the opening of the provisional canal as far as Lake Timsah, was celebrated on November 18, 1862. The words were given, "By command of His Highness, Said Pacha, Viceroy of Egypt;" and the water of the Mediterranean gushed half-way across the isthmus. The building of the Suez Canal is the most important project ever undertaken in that remote section.

THE four British iron-plated frigates, *Warrior*, *Black Prince*, *Defense* and *Resistance*, have been out in the Bay of Biscay during recent great storms, and it is stated they proved to have excellent sea-going qualities. How many conflicting accounts have been published respecting those vessels! It had been reported that they were unfit for sea voyages.

Improved Washing Machine.

Such of our readers as are disposed to embark in a manufacturing enterprise are referred to the advertisement in another column, offering for sale manufacturing rights in the "Nonpareil Washing Machine." The patent for this machine was procured through our agency in Sept. 1860; and in the interval the proprietors, Messrs. Oakley & Keating, of this city, have been successfully employed in placing it before the public. For the past year we have used two of these machines with entire satisfaction; and the evidence submitted to us is conclusive as to the high appreciation in which the machine is held by the public. The steadily increasing demand for domestic labor-saving machinery bids fair to make this a very valuable patent. This machine was illustrated in the SCIENTIFIC AMERICAN, Vol. V. (new series), page 232.

NEW YORK MARKETS.

COAL of stove size is retailing a $8 per tun of 2,000 lbs.; in May last year it was on $5.

COFFEE is selling at 31 cents per lb. it was 17½ cents in the early part of 1862.

COTTON is selling at 69¼ cents per lb.; in 1861 it was 13 cents.

FLOUR ranges from $5 85 to $8 25 per barr ; in the beginning of 1862, the highest price was $ 0 per barrel. It is a fact, however, that flour, me and provisions have not advanced in the proportio of most other articles.

BLEACHED SHIRTINGS are selling at from 24 to 25 cents per yard, wholesale; in May 1862 the price was 10 cents. Bleached drillings are 25 and 29 cents per yard.

WOOLEN CLOTHS are about 33 per cent higher than in the early part of 1862. It is scarcely possible to make a comparison between the present and past prices of cotton cloth per yard, as the fabrics now manufactured appear to be generally so much inferior to those formerly made.

CANTON FLANNELS, selling at 36 cents per yard, are not equal in quality to those formerly sold at 12 cents.

PIG IRON is $31 per tun; in 1861 it was $23. Refined English bar is $75 and $77 50 per tun.

LEATHER is 27 and 30 cents per lb., which in the beginning of 1862 was 19 and 21 cents.

SALTPETER, which is one of the great elements for conducting war, as it is the prime constituent of gunpowder, is 19 cents per lb.; it was formerly 5 cents.

STEEL, English, is 17 cents per lb.; American spring, 6 cents.

SUGAR, New Orleans, is 10¾ cents per lb., Stuart's refined white, 13½ cents; in 1861 the former was 7½ cents and the latter 10¾ cents.

TEA ranges from 50 cents per lb., up to $1 20: The duty is 20 cents per lb.

WOOL, Saxony fleece, is 60 and 62 cents per lb.; common, 48 and 50 cents; California unwashed wool, from 20 to 50 cents. The prices of wool have about doubled in eighteen months.

THE prices of most articles, in relation to the price of gold, are not so much higher than they were formerly. It is the depreciation of the currency, which has caused such an apparent rise in the prices of merchandise. In anticipation of a further large issue by Government of legal tender notes, gold has advanced from 32 to 35 per cent premium within a few days. Foreign exchange has also advanced. Bills on London are 146 and 147½ per cent. The high rate of foreign exchange has perhaps been of great benefit to many of our manufacturers, as foreign importations have been curtailed thereby. We understand that many heavy importers of foreign goods have recently invested largely in real estate in this city.

The Patent Office Reports for 1861 and 1862.

Congress having failed to make an adequate appropriation for the publication of the Patent Office Mechanical Report for 1861, none for that year will be published for distribution, unless the present Congress can be prevailed upon to make an appropriation for the purpose. The Mechanical Report for 1862 is in progress of publication, but will not be out before next autumn. The SCIENTIFIC AMERICAN for 1861 contains the claims of all the patents issued in that year, and to it persons are referred for the information they require concerning the doings of the Patent Office during 1861. The claims of all the patents granted in 1862 may also be found in the two last volumes of the SCIENTIFIC AMERICAN, and, as usual, each week's issue of this paper will contain during the ensuing year (1863), the official list of claims as they are granted weekly at the Patent Office. This list is furnished expressly for the SCIENTIFIC AMERICAN, by the Patent Office, at an expense to the publishers of several hundred dollars per annum, and in no other journal in this country are they published in full.

MUSKRATS.—A correspondent, writing from Pennsylvania, complains of being much troubled with muskrats, and wishes to ascertain, if possible, how he can destroy them. We will publish sensible suggestions on this point.

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STORMS.

The phenomena of storms have ever been and still continue to be a fascinating study to most men. The following is one of a series of articles on storms written by Mr. F. A. Morley, of Sodus Point, Lake Ontario, N. Y. :—

By far the most violent and destructive of storms are those of the rotating order. Instances can be cited where minor whirlwinds have formed avenues of not more than one hundred and fifty feet in width through forests, with as much regularity and as thoroughly as though they had been made by a body of engineers; and the larger whirlwinds, such as the typhoon, hurricane, and tornado are the most disastrous and terrible of all storms. Now whence comes this particular freak of rotation, and whence arises this amount of atmospheric energy? Professor Maury and others accredit this phenomenon to the agency of electricity, but such a theory does not appear satisfactory. Whirlwinds are caused by heat and the diurnal rotation of the earth upon its axis. One proof that heat is one of the agencies employed is, that they occur only in warm latitudes, being more powerful near the equator, while at the thirty-fifth parallel they become weak, and, beyond that, soon run out altogether.

I will quote a few interesting lines on this subject from "Fitch's Outlines of Physical Geography":—"The terms, hurricane, whirlwind, water-spout, land-spout, sand-pillar, tornado, white-squall, pampero, &c., have been applied to rotary movements of the atmosphere in different parts of the world. Hurricanes are revolving storms which occur in the West Indies and in the Indian Ocean. Of a similar kind are the typhoons in the Chinese Sea. These circulating movements occupy a space from fifty to five hundred miles in diameter. They revolve more rapidly nearer the center, up to a certain distance, within which there is a calm. The center of rotation advances steadily along a definite line upon the globe, with a velocity varying from two to thirty or forty miles per hour. It is a remarkable fact, that in the same hemisphere these whirling storms always revolve the same way, but that this direction is opposite in opposite hemispheres. In the Northern hemisphere their rotation is retrograde, or in a direction opposite to the hands of a watch. In the Southern hemisphere their rotation is direct, conformable to the hands of a watch. There are three well-known hurricane regions—the West Indies, the Indian Ocean, and the Chinese Sea. The general course of the West Indian hurricanes is from the Leeward Islands, N. W., passing around the shores of the Gulf of Mexico, or across it, then following the Gulf Stream and terminating in the Atlantic, or exhausting their fury in the United States."

Now, to further facilitate my explanation, I will give a hypothetical answer to a question published on page 134 of Vol. VII (new series) of the Scientific American, by R. F. Stevens, asking the reason why water escaping through an orifice in the bottom of a common pail forms a whirlpool in the pail, above the orifice.

The whirlpool is caused by the diurnal rotation of the earth upon its axis. The passage of air down through the tube has nothing to do with the phenomenon, it being a resultant of friction only. Water will always whirl in the same direction in the vessel under like circumstances in the Northern hemisphere; but in the Southern hemisphere the direction will be reversed.

The direction of the whirlpool in the Northern hemisphere is against the hands of a watch; in the Southern hemisphere, with the hands of a watch. According to various authorities, all whirlwinds north of the equator move around against the hands of a watch, and south of the equator in the opposite direction. Both the whirlwind and whirlpool in question get their circular motion from the same source, move around in the same direction, and are much alike in principle, as I propose to show, only the whirlwind is the experiment of the pail inverted. But first we will take the whirlpool. The opening is formed in the bottom of the vessel, and as water begins to escape particles of water rush towards the orifice from all directions, those coming from directly east and west would, were they not crowded by other particles which are differently affected, move directly for the center of the orifice, but all particles moving with a south or southerly direction (in this hemisphere) have a tendency to the right of the center, or to the west; for the reason that as they advance southwardly their distance from the earth's axis of rotation is increased, and, as they do not acquire the increase of centrifugal velocity, are in a measure left behind; or, in other words, move to the orifice not in a straight line, but in the form of a slight curve, with its convex towards the center of the orifice. The same cause effects all particles moving northwardly in a like manner, only, as they move nearer to the earth's axis of rotation, their centrifugal velocity is greater than the earth at the new pcint whence they are drawn; consequently they also tend to the right, or to the east. This power gives the water at the orifice a circular motion, which soon extends to the surface of the fluid, when the centrifugal force of the revolving column bars the surrounding fluid from its center, while its center, having little or no centrifugal force, escapes more readily, and forms the revolving shaft of fluid into a hollow tube.

Now let us take the whirlwind; and as we are now to examine a whirl of air instead of water, it will be necessary to look at its physiographical state and disposition over and about the earth. It is a well-known fact that the upper stratums of the atmosphere, over the whole earth, are much colder than the stratum next to the earth's surface. This is shown by perpetual snow-capped mountains, by the experience of balloonists, &c. It is also well-understood that cold air is heavier than warm, and wherever there is a chance for it to do so, by establishing a current, it will by its weight crowd out into upper space the underlying, warm, and lighter stratum. One great established outlet for the warm air is at the equator. It extends around the entire earth; here the escape of heated air into the upper regions is perpetual. This getting rid of the lower stratum of heated air cannot be done to any extent only by means of currents, as radiation or transmitting of heat from particle to particle can amount to nothing. Also, let us remember that the dividing line between cold and warm, or upper and lower stratums, is very distinctly defined, owing to their rapid transmission in opposite directions from north to south, as upper and lower trade-wind currents, &c. Now, let us also reflect that it is not an easy matter for the light and underlying stratum to find a weak spot in the upper one, where it may force a passage and establish an outlet into upper space, for the reason that the pressure of the upper stratum is so evenly distributed and maintained. I refer more particularly to regions over the seas, for over continents the disturbing causes are numerous and the action of the atmosphere very irregular.

Now the explanation of the whirlwind is this:—where it takes place we have a lower stratum of hot air which is confined and held down by the weight of a colder stratum above. Some disturbing cause, as, for instance, the heat of an island, affects the level of the upper stratum, and exposes a point less strong than the rest, when the light air forces an opening up through into space. The orifice once established, the warm air ascends with great velocity, making a partial vacuum in the lower stratum immediately beneath the orifice—warm air from all directions along the earth's surface rushes for the vacuum (or hole in the pail), the diurnal rotation of the earth does the rest and gives the storm a rotary motion; the incoming particles of air being acted upon the same as the particles of water in the experiment of the whirlpool. The storm continues probably until the upper stratum has conveyed the orifice to some point where it is itself broken up; as at the calm belts of Cancer and Capricorn. The rain commonly attending such storms is manufactured, if I may use the term, for the occasion, and how simple and beautiful the process! The warm air, while in its travels over the face of the ocean, has become saturated; it ascends into space and expands, and as it expands its capacity for caloric becomes increased, its temperature falls, its moisture is condensed and takes the form of rain, or mist; forming an upper stratum around the orifice of heavy, black clouds, such as form the spots on the sun. Were it a known fact that some whirlwinds in this hemisphere revolved *with* the hands of the watch, I should suspect that a column of the cold upper stratum had found its way down through the lower one, to the earth's surface, and in spreading out, the direction of the particles being changed, the rotation of the storm was also reversed, which, under such circumstances, would be the case; although such a supposed storm would necessarily be a tame affair, compared with the reversed proposition.

(To be continued.)

Curious Effects of Iron Plating on Vessels.

A communication from Toulon, France, in the *Messager du Midi*, says:—The laying up of the frigate *La Gloire* in the Castigneau dock has disclosed three unexpected phenomena:—First, that the contact of the copper lining and the submerged iron plates had established a galvanic current, which produced the effect of a voltaic pile, and was completely deteriorating the armor of the frigate in the parts below the water-line; second, that a species of shell fish, hitherto unknown, was afterward discovered among the millions of mollusca by which the hull was covered, apparently produced under the influence of the same galvanic current; and lastly, in the hold of the vessel twenty-two thousand litres of wine were found to be transformed into vinegar, it is not known by what influence.

[The above has had quite an extensive circulation, as we have noticed it in at least a dozen of our cotemporaries. It certainly requires explanation. The frigate *La Gloire* is iron-plated upon wood for several feet below the water-line, and we have seen it stated that her bottom was sheathed with copper. It is well known that when iron and copper are connected together in salt or fresh water, a galvanic battery is thereby formed, and the iron decomposes rapidly, it being the positive metal. Now, we cannot believe that the French naval authorities were such ignorant fools as thus to connect the copper sheathing and the iron plating of the *La Gloire*, as stated in the above paragraph. It is also stated that the influence of the galvanic current produced a new shell fish, which was found adhering to the armor of the frigate below the water-line. If true, this at once disposes not only of science but of Donald McKay's high opinions of the coppered-bottomed, wooden-framed, iron-clad vessels of the French navy. The most funny portion of the paragraph is that which relates to the twenty-two thousand litres of wine having been turned into vinegar. Wine will change into vinegar if exposed to the atmosphere in any moderately warm place, independent of copper sheathing and iron plates.—Eds.

The Coal Trade.

Over one million five hundred thousand bushels of coal left this city for points below on the late rise. Of this, seven hundred and forty thousand bushels were destined for Cairo, and some seven hundred and eighty thousand bushels for Cincinnati. Five hundred and sixty thousand bushels went out in floating barges, and the balance in barges towed by eleven tow-boats. This is the third run of coal we had this season, so that by this time the wants of those below us must be pretty nearly satisfied. There has been no rise of moment in the Monongahela, this fall, and the result is that there is an immense amount of coal lying in the upper pools which cannot get down. This has been unfortunate for the owners, who, had they been able to get it to market, would have received the highest price for it.—*Pittsburgh Chronicle.*

[The coal referred to by our cotemporary is bituminous, and so happily are the people of Pittsburgh and those of the towns in the Ohio valley situated with respect to it, that a tun is obtained by them for less than two dollars. The retail price of anthracite in New York at present is eight dollars per tun for stove size. The bituminous coal trade of the West must now be very extensive, but while we have very reliable statistics respecting the quantity of anthracite mined annually, no such statistics can be obtained of our bituminous coals.—Eds.

A Rich Engineer.—Wm. James Walker, a very eminent Scotch civil engineer who recently died in London, left property valued at $1,500,000, which he had accumulated by his profession. While in life he lived in princely style.

The Chicago *Tribune* is printed on paper which is one-quarter sorghum fiber. Two sorghum paper mills are already running in Illinois.

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SOLAR CHEMISTRY---SPECTRAL ANALYSIS.

The foreign reviews, consisting of the *Westminster*, *London Quarterly*, *North British* and *Edinburgh*, published by Leonard Scott & Co., of this city, contain criticisms on published works, but these generally, only serve for texts to some of the best essays in the English language. In the last number of the *Edinburgh Review* there is a brilliant article on "Solar Chemistry." This appears to be a somewhat singular theme. It may be asked "what can man know of the chemistry of the sun—a body so distant and so replendent that no human eye can calmly gaze upon it for a moment?" Science has measured the distance of the stars, the times of the planets, and now she has dared to gaze into the sun and analyze its constitution. Recent scientific discoveries have conferred upon man new powers of investigation, whereby nature has been made to reveal secrets so subtile that they never had been dreamt of before in philosophy. Sir Isaac Newton first dissected a ray of light, and proved that it was composed of several colors; and in 1802, Dr. Wollaston discovered quite a number of dark lines in the colored portions of the spectrum. The German optician, Fraunhofer, subsequently investigated this subject, and with improved instruments he counted no less than 590 of these dark lines stretching throughout the spectrum from red to violet; and in 1815 he drew a beautiful map of them. He also discovered that these dark lines were visible in reflected, as well as direct solar light, for on looking at the spectrum of moonlight and the light of Venus, the same lines appeared unaltered. Applying his examinations to the stars, he found that their light was not of the same kind with the light of the sun, and he therefore drew the conclusion that these dark lines in the spectrum had their origin in the sun. Such inquiries were extended by Sir David Brewster and Dr. Gladstone, but the subject has recently been elevated into a special science, called "spectral analysis," by the splendid discoveries of the two German professors—Kirchoff and Bunsen. Instead of using only one prism, like Fraunhofer, Professor Kirchoff used four prisms of very perfect workmanship, to obtain greater dispersion of the lines, and he examined the solar spectrum through a telescope having a magnifying power of 40. When he first gazed through this instrument, the beauty of the sight threw him into raptures. He saw whole series of nebulous bands and dark lines, and a new field of vision, like that first developed by the microscope, was opened up. Kirchoff measured the distances between the dark lines by moving the cross wires of the telescope from line to line by means of a micrometer screw. The breadth and depth of the lines were also measured and mapped off, and they have been printed in colors. These dark lines it is conjectured have been made to reveal the chemical composition of the sun's atmosphere. This was determined as follows:—Certain substances, such as iron, sodium and other metallic salts, when inflamed, give off peculiar kinds of light. Practically this had been known for a long period in producing colored fireworks. Strontia produces the rose-colored fire of the pyrotechnist, and common salt thrown into the fire produces a yellowish colored flame. There are now about 65 simple substances known in nature, each of which produces, when inflamed, a light different from all the others. This is the basis of the new method of spectral analysis—a science which demonstrates the chemical composition of a body by the color or kind of light which is emitted from it when it is highly heated. No matter how distant an object may be, its light may be examined by this method. If a small quantity of the alkaline earths, such as soda or potash, is placed in the flame of a spirit lamp, the salt becomes gaseous, then luminous, and it then tinges the flame with its peculiar color. The compounds of other metals, such as iron, silver and copper, require a higher temperature; but with the intense heat of the electric spark they can all be rendered gaseous and luminous, and each is like a letter in the alphabet going to form a new scientific language, which has revolutionized qualitative analysis; and by it, minute traces of substances that had proven far too subtile for old modes of investigation may be detected. Thus for example, all the compounds of sodium (common salt is one) give two very fine bright yellow lines placed close together, all the rest of the field in the spectroscope being dark. No other substance is met with in the spectrum in which these lines occur. So delicate is this indication of sodium, that common salt has been found by it in all floating dust. Bunsen has detected the presence of $\frac{1}{180000000}$ of a grain of soda; and we have learned by this new science that common salt derived from the ocean is always present in the atmosphere in a very finely divided solid form; and doubtless it produces important effects upon the animal economy everywhere, even in regions far remote from the "great deep."

If a small quantity of potash instead of soda is used, the flame is tinged with purple, and its spectrum consists of a portion of continuous light in the center, bounded by a bright red and a bright violet line at either end. This appearance is produced by all the compounds of the metal potassium. In the same manner, each metal or its compounds produces its own peculiar colored bands, and its presence is thus indicated. And as these metals and their compounds fuse and become luminous at different temperatures, the presence of mixtures of them has also been determined by this method. A mixture of common salt, chloride of lithium, chloride of barium, chloride of calcium and chloride of strontium, containing $\frac{1}{1000}$ part of a grain of each substance has been analyzed by Bunsen. These substances become luminous one after another, and their special colors and bands were distinctly noted in the spectroscope. This new power of analysis is truly wonderful, and two new alkaline metals have already been discovered with it by Bunsen. The one is called "cæseum," because of its bluish color; the other "rubidium" from its red flame. Forty tuns of mineral water were evaporated to obtain 105 grains of the one and 135 grains of the other metal.

This mode of investigation has also been applied by Kirchoff to an examination of the character of the sun's luminous atmosphere, and it is stated, that both sodium and iron have been detected in it, and it is believed that the sun is composed of the same matierials as those in our own planet. Different opinions have been entertained respecting the constitution of the sun. Gallileo believed it was a great sphere of fire; but Sir William Herschel and others adopted the theory that the sun was an opaque solid body with an outer luminous atmosphere. The dark spots seen on the suns' disk were supposed to be openings in the luminous atmosphere, revealing the dark body of the luminary. Kirchoff considers this a physical absurdity. An intensely ignited photo-sphere surrounding a cold nucleus is impossible according to his views. Everything relating to the sun possesses a deep interest to man. Without its light and heat there would be no life on our planet. But much has yet to be learned before a dogmatic opinion should be entertained repecting its constitution. Recent observations made upon the sun by Mr. James Nasmyth—the inventor of the steam hammer—have led to the discovery that the mottled appearance which the surface of the sun exhibits is due to the presence of luminous bodies which interlace and cover its surface, and which are shaped like leaves of willows, thousands of miles in length. Mr. Nasmyth states that these bright bodies move with astonishing velocity. Imagination fails to give us the slightest clue to the probable constitution of these recent astronomical novelties. Solar chemistry is but in its infancy, and may still be considered very imperfect; nevertheless it has opened up, as it were, a new world for investigators, and it is one of the greatest achievements of science in this age.

A SUBSTITUTE FOR COFFEE.—According to the statement of Liebig the seed of asparagus contains a considerable quantity of caffein; when roasted and ground and infused with water in the regular way, it gives a drink resembling Mocha coffee. The high price of coffee might thus induce persons to use this substitute where it can be readily procured.

[So says a correspondent, and we give the receipt for what it is worth. We have tried a great many of the so-called substitutes for coffee and found them poor indeed. The best substitute for the real berry is, in our opinion, cold water.—EDS.

The Electric Lamp for Lighthouses.

In one of his reports on the Dungeness light, written during the year 1862, Professor Faraday mentions an interesting experiment. Arrangements were made on shore (Mr. Holmes being in charge of the light), by which observations could be taken at sea about five miles off, on the relative light of the electric lamp and the metallic reflectors with their Argand oil lamps. At the given distance the eye could not separate the two lights, but by the telescope they were distinguishable. The combined effect was a glorious light up to the five miles. Then, if the electric light was extinguished, there was a great falling-off in the effect; though after a few moments' rest to the eye it was seen that the oil lamp and reflectors were in their proper state. On the other hand, when the electric light was restored, the illumination became again perfect. Then, while both were in action, the reflectors were shaded, and the electric light left alone; but the naked eye could see no sensible diminution; nor when the reflectors were returned into effectual use could it see any sensible addition to the whole light power; though the telescope showed that the alteration in the lantern had taken place at the right time. Such was the power of the electric light that the addition or subtraction of the light of a fully effective set of reflectors, with their lamps, would not have been sensible to a mariner, however observant he might have been. Professor Faraday enumerates some points which are against and others in favor of the light. In the first place, the simplicity of the present system is very great compared with that of the electric light; only two keepers are required to a lighthouse; they need possess no special knowledge; ordinary attention is all that is necessary, and thus failures of the light are almost impossible. In the new system a second set of men will be required to attend the engines, and there must be amongst them one or more who understand the principle and construction of the lamp in the lantern, of the magneto-electric machines, the steam engines and the condensers, and be able to make effectively the repairs necessary to the apparatus. In the next place, the expense of the new system must be large compared with that of the present system. Other objections have been made, of which Professor Faraday cannot see the force, namely, that the light is too bright, that it gives a false impression of the distance of the lighthouse and that it blinds the eyes of the mariners to the perception of the lights on board of vessel between it and them. These objections, he says, if they have any force, must be judged by mariners themselves. The points in favor of the magneto-electric light are strong and clear in relation to the increase of light. In cases where the light is from lamp-flames fed by oil, no increase of light at or near the focus or foci of the apparatus is possible beyond a certain degree, because of the size of the flames; but in the electric lamp any amount of light may be accumulated at the focus and sent abroad, at, of course, an increased expense. In consequence of the evolution of the light in so limited a focal space, it may be directed seaward, diverging either more or less, or in a vertical or horizontal direction, at pleasure, with the utmost facility. The enormous shadow under the light produced by the oil-flame burner, which absorbs and renders useless the descending rays to a very large extent, does not occur in the magneto-electric lamp; all the light proceeding in that direction is turned to account; and the optical part of the arrangement, whether dioptric or reflecting, might be very small in comparison with those in ordinary use.—*Athenæum.*

AN IMPROVED BOTTLE.—Mr. E. Drewett, of Blackheath, England, has obtained a patent for a bottle having a partition near the bottom, for the purpose of separating and filtering the contents. Bottles so constructed may have their contents decanted, and the whole of the sediment retained in the lower chamber.

THE winter clothing of a Southern soldier is expected to cost $98 50, according to Richmond prices current, for a cap is worth $5, a jacket $25, a pair of pants $32, a pair of shoes $18, two pairs of woolen socks $5 50, two woolen shirts $10, and two pairs of drawers $8.

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Correspondence

American Iron Ores and Coal.

The following is a letter recently written by an English iron manufacturer from Montreal to a friend in Buffalo, N. Y. He gives his opinions principally respecting our iron ores and coals; he having visited this country chiefly with a view to examine the iron districts. He says :—

SIR :—Agreeably to my promise I write you. I am charmed with Canada. The people are active, thriving and industrious, and are destined to become a powerful community in time. As yet manufacturing is in its infancy, and on every hand you see evidences of the Colonial State resting upon the mother country—looking over the water for what should be provided at home. But for the "Reciprocity Treaty" Canada would now be in a poor state.

I promised to tell you what I thought of the iron trade in America. I find that coal of the finest kind for iron-smelting, &c., abounds in Eastern Pennsylvania; but there is a great want of good and cheap iron ores in or near the coal-fields, so much so that the most prosperous works are hundreds of miles away from the source of the fuel. Much iron is made near Harrisburgh, of inferior quality, from ores found in vast abundance near Lebanon, which are mined for a trifle. Good ores abound in New Jersey, but their extraction is somewhat costly as they lie beneath the water-courses mainly and have to be regularly mined. Coal for their reduction is not very expensive, still the iron is not made very cheaply. In the bituminous regions of Pennsylvania ores of good quality do not abound, and but few seams of coal are found to be suited to the smelting furnace. In one or two places a cheap but poor iron is made. Ores are not found around Pittsburgh, though I had, till I visited the place, an idea that it was the seat of your iron trade. The business there is a forced one; while charcoal could be had, it was a good point for the manufacture; but now the few smelting furnaces procure their chief supply of iron ore from Lake Superior and sometimes from as far off as the Missouri iron mountain.

There is in Ohio, near Portsmouth, a great abundance of tolerable ore and plenty of coal; but the coal is utterly unfit for smelting, and when the forests cease to yield charcoal no good iron can be made there.

In Missouri, where iron ore abounds, mineral coal suitable for smelting is not found. The coals of Ohio (except one rare seam in the east) Kentucky, Indiana, Illinois and Iowa are not fit for use in smelting iron; the ores of these latter-named States are those of the coal measures.

New York State, in the north-east and south-west, abounds in excellent ores (primitives) and is within reach of excellent smelting coals. The same coals can be cheaply delivered on the lake ports, and equally cheaply can the pure and rich ores of Lake Superior be delivered at those ports.

In my opinion the main seat of your iron manufacture will be on the great lakes, at places where the only good smelting coals you have in any abundance can be delivered by water transport at low prices. This idea, probably, will be thought visionary, but time will prove its soundness. It is not known, perhaps, that English and Welsh iron-masters now procure large quantities of iron ore from foreign countries, and from counties in England many hundreds of miles from the works where they are used.

I found but one place in all America (that was near Harrisburgh) where crude iron could be made for less cost than you are now making it in your city. Very good and reasonably-expensive iron is made along the Hudson river, but they have no such good ores as those of Lake Superior. Your town is destined to be a great iron-producing one, and your waters have many equally fitting places for that production.

Hoping and praying that the shadow of the great republic may never grow less, I remain, yours truly, G. B.

Montreal, C. E., Nov. 22, 1862.

Santa Cruz, California.

MESSRS. EDITORS :—Your valuable paper comes to hand now very regularly. When it used to be sent by the overland mail there were great gaps between the numbers. The SCIENTIFIC AMERICAN is very much appreciated amongst our citizens as you may judge by the number of subscribers you have in this place. I read each number with great avidity, and as I am employed in a manufacturing establishment, some of the published hints have proved quite valuable. Although I had a slight previous knowledge of chemistry, I picked it up by tuition rather than study; but by reading the articles that have appeared from time to time in the SCIENTIFIC AMERICAN, they have given me quite a zest to drink more deeply of the Pierian spring.

Our little town is one of the most thriving in the State (due to the immense quantities of lumber and limestone in the neighboring mountains); five schooners and one steamer are employed in carrying the various products of our town to San Francisco; such as lumber, lime, leather, paper and glue. As the community is an industrious one it necessarily follows it must be a patriotic one. The county has accordingly raised two companies of volunteers and recently $5,000 has been paid into the patriotic fund. The county is not more than twelve years old; before 1850 there were very few people here.

J. B.

Santa Cruz, Cal., Nov. 21, 1862.

The Revolutions of the Stars---An Error Detected.

MESSRS. EDITORS :—Under the above caption, in the issue of the SCIENTIFIC AMERICAN of December 20th, Rev. Mr. Loomis, of Martindale Depot, N. Y., gives the world information which is "important if true." Instead, however, of convicting astronomers of error, he really labors to show that *the year ought to consist of a whole number of days, without a fraction.* He, in effect, attacks "leap year," Julius Cæsar, Pope Gregory XIII, as well as Old Style and New Style; and that, too, in a way which would be amusing, if it was not so ridiculous.

Suppose that at any given date, say January 1st, at midnight, the sun, earth, and some star, should all be in a line. To a person on that part of the earth opposite to the sun, the star would be on the meridian, and the *time* would be midnight. At the end of 23 hours, 56 minutes, 4·09 seconds, the star would again be on the meridian of the same observer, but the sun, earth, and star would no longer be in a line, the earth having moved forward in its course. After the lapse of another such period the star is again on the meridian, but the earth has departed still further from the line joining the sun and star; and so it goes on from day to day, the earth running in an orbit nearly circular. At the end of 366 such revolutions the star is on the meridian, but the sun, earth, and star, are not quite in a line, it requires yet 6 hours, 9 minutes, 6 seconds, for the earth to come up. In this time the star apparently travels 92° westwardly from the meridian; but the sun, by the same quantity, has approached the eastern horizon, and is in a line with the earth and star; and so the annual revolution of the earth is not expressed by a *whole number* of days—and that is all. There is no mystery, error, or difficulty in the question. The reverend gentleman has merely got into a strange latitude and lost his reckoning.

R. W. MCFARLAND.

Oxford, Ohio, Dec. 26, 1862.

Ventilating a Cellar.

MESSRS. EDITORS :—In my sitting room, immediately over the cellar, I have a small cast-iron, air-tight, wood-burning stove, with three and a-half feet of 6-inch pipe connected through a thimble with the chimney flue at about one foot from the stove. I have made a T-connection with the stove pipe with pipe of the same size, passing through the floor and reaching to within a foot of the cellar floor. At the top of this pipe, close to the connection with the stove-pipe, there is a valve which regulates the draft of cold air taken from the cellar. The opening in the floor is half an inch larger than the pipe. The vacuum produced in the cellar by the draft in the chimney-flue, draws air down from the chamber through the space around the pipe in the floor. My cellar, which was before damp, is now as dry and pleasant as any room in my house. Formerly, articles placed in my cellar soon became moldy and were spoiled for want of ventilation. E. C.

Point Pleasant, Ohio, Jan. 2, 1863.

The Proportion of Key-seats.

MESSRS. EDITORS :—I have never found in any work a standard for key-seats for given diameters, and would ask if you know of any? It would add much to the economical workings of a machine-shop if a standard size could be established, and much facilitate the erection of engines and machines generally, when parts are made at different establishments. I would also call attention to the difficulty experienced in arriving at equal measures of length or diameter, without the use of apparatus too expensive for small establishments. I find it impossible to secure from several persons using the same sliding gage, the same divisions of length; how is it possible under such circumstances to interchange parts where extreme accuracy is required? Even with the use of the expensive standards for this purpose, we find much variation in the same establishment. There are many matters of interest to our mechanical engineers and workmen and the public generally, which I hope may induce an interchange of experience through your columns. A. B.

Questions for Millers.

MESSRS. EDITORS :—A long experienced miller assures me that, with him, it is an essential object to have the stones grind warm as possible, and that at all times he cannot get them to grind warm enough. The reason he gives in support of these ideas is that he may bolt the flour warm and thereby prevent it from bolting so freely, for, he says, when the flour is cool it bolts too free, and he is afraid of it bursting the cloths. I have always thought it a desirable object to have the stones grind cool, and also to bolt the flour cool. Is it not desirable to get rid of the ringings by practical means, and would it not be an improvement to keep the stones cool and enable them to grind freer? T. WILBUR.

Baltimore, Md., Dec. 26, 1862.

Draining Tiles.

MESSRS. EDITORS :—I am a farmer, and, like every other member of the calling around me, greatly in need of draining tiles. I have the material but not the machines for making them. There are no machines for this purpose advertised in your paper as they ought to be, and I shall be glad to correspond with the manufacturers of them; can you give me the address of any of them? F. R. MILLER.

Sugar Grove, Pa., Dec. 22, 1862.

Correspondence and Advertising.

A correspondent addresses to us the following inquiries :—

First: From one of your numbers, I learn that you charge advertisers twenty-five cents per line. How often do you insert for that? and do you not allow subscribers a discount on their insertions?

Second: Are lengthy essays on scientific topics subject to a similar charge? or do you consider and insert them as contributions free of charge, calculated to enrich your paper and make it attractive?

We reply, first: We uniformly charge twenty-five cents per line for each and every insertion of advertising matter in the SCIENTIFIC AMERICAN. Our charges are the same to all, without distinction of age, sex or color, Jew, Greek and Gentile, all are served alike.

Second: Lengthy essays on scientific topics we do not insert on any terms. We solicit short pungent articles upon all scientific topics as are likely to interest our readers. In all parts of our land, there is a vast amount of useful information to be gleaned, which has reference to the practical arts of every-day life; facts that ought not to lie longer in the rubbish. We urgently call upon our readers to gather up and carefully assay their precious gems, and send them to us for publication. They will enrich our columns, and add much to their value and interest. We want no dry speculations on abstract science; but we seek for the current facts that enter into the routine of every-day life, in the shop, the mill, and the laboratory.

QUICK PASSAGE OF A SCREW STEAMER.—The late voyage of the steamer, *City of Washington*, is said to be the quickest for a screw steamer on record. She made the passage from Sandy Hook, New York, to Rock light, Liverpool, in 9 days 19½ hours.

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AN APPALLING NAVAL DISASTER---LOSS OF THE "MONITOR."

The celebrated *Monitor*, whose fame is world-wide, has, we regret to say, met an adversary to whose strength and prowess she was obliged to succumb. She sprung a leak and foundered at sea off Cape Hatteras, on the 31st ultimo, with all her officers and crew on board; out of the whole number thirty-two perished. She was at the time in tow of the gunboat *Rhode Island*; a portion of this latter ship's crew were also lost, as the despatches say, in endeavoring to rescue their comrades from the sinking battery. It would be manifestly unjust to all parties concerned, to indulge in any strictures upon this disaster. An accident of this kind might possibly happen to any steamboat, frigate, or any iron vessel afloat, but it is extremely unfortunate at the present time, when the sea-going qualities of such vessels are almost untried. It will afford an opportunity for the wiseacres to shake their heads and wag their beards, and to say that they always knew it, and always predicted just such an occurrence.

The *Monitor* was, it seems, in tow, as before-stated, and made the first part of her voyage in safety. When she was off Cape Hatteras the gale was so light that Commodore Bankhead thought it useless to run for Hatteras Inlet, then about fifteen miles distant. The wind, however, increased as the night advanced, until it became a perfect storm. The sea ran very high, at times passing over the turret. The *Monitor* now began to leak, but the pumps freed her, and so far all was well. The storm still increasing the leak also gained, until it became a serious matter. Andrews's pumps threw overboard about 3,000 gallons of water per minute, but in spite of all, the water gained upon the crew. It was now known positively that the vessel was leaking badly. The storm raged fearfully; the sturdy forces of the sea collected, they buffeted the poor *Monitor* sorely; and retreating to gather new impetus, they rushed upon her, broke over her, and so smothered the little craft, helpless against this element, that her presence was only marked upon the waves by a ring of foam where the waters lashed her turret in their mad rage! A huge wave lifted the *Monitor*, but as she descended to meet its fellow, instead of rising on the crest as other vessels do, she tore through it. The armor shelf at her bow overhangs so far—32 feet aft and 14 forward—that the force of the sea is supposed to have parted the hull from it, thus causing the leak, the loss of the brave little battery and a great part of her crew. This defect has been remedied in the new *Monitors;* and, as a consequence, the *Passaic* and *Montauk*, which also encountered the storm, went through it with only slight inconvenience.

The convoy *Rhode Island* nobly assisted the *Monitor* in her peril. When it became known that it was impossible for the latter to live through her trial, Commander Bankhead, of the *Monitor*, called out "Who will cut our hawser?" (tow-line); then a brave fellow, Mr. Stoddart, the master, answered "I will;" and while the sea threatened at every stroke to swallow him up, as it already had his comrade, he hewed away at the heavy hawser, nearly as thick as a man's leg, for fifteen minutes until it was severed. It was exceedingly dangerous to go upon deck; many of the crew were swept from thence. Lieutenant Green, a brave young officer, was carried off by a sea, and thrown on deck again by its reflux. Others saved themselves by the life-lines that were rove on deck. But through all, and above all, there was the splendid discipline of the navy; no man scrambled for safety, all obeyed orders. Calmly they went to their stations, as though battling with an enemy whose power they should crush as they had hitherto crushed all others. Boats put off from the *Rhode Island*, and, balancing on the high seas that threatened each moment to engulf them also, came hurling down upon the foundering, staggering little craft that still bore up bravely. They passed and repassed on their errands of mercy, and carried off numbers, who were received by their messmates on board of the convoy with open arms, regardless of rank. In the midst of all, the hawser which had been cut loose from the *Monitor* got foul of the *Rhode Island's* wheel, so that the engine could not be worked. The launch had just put off from the ship, and was between the two vessels as they came down toward each other. Lifted by the huge swells the two vessels surged heavily on, came nearer still and threatened to strike, but they, bowing on the sea in awful semblance of courtesy in this dreadful hour, glided by each other, and so escaped, just crushing in their passage, the launch's sides above the water-line. Undaunted by this, the brave fellows pushed on with their broken boat, and reached the *Rhode Island's* deck with their cargo. Providence, in this time of tumult and destruction, averted that blow; had the vessels struck each other, both would have inevitably perished; none would have escaped to tell the tale.

Amid all the warring of the storm, amid the hoarse cries of the hungry waves, the moon shone calmly down, whitening with her rays the yeasty foam that seethed and sucked amid the eddies, and against the ship's sides. Some men, clinging to ropes that depended from the convoy's side, caught hold of them and were assisted by those above into safety; others of the *Monitor's* men still clung to the turret top, vainly hoping for escape and succor, yet neither seeing nor finding any. About two o'clock A. M. a last effort was made to reach these brave fellows; the cutter was manned with a picked crew and started for the *Monitor*. Pitching and tossing they steered for her, now in sight, now lost amid the vortices that swirled on every side. Whether they reached her or not is unknown at present; the moon at this juncture went down, and the gallant adventurers were lost to view.

THE LAST OF THE MONITOR.

The *Monitor* was last seen at this time, about a mile and a quarter distant; just before the moon vanished she was seen laboring in the trough of the waves; afterward, for a brief time, her lights were visible, when suddenly they disappeared wholly, and it was known that the little battery, whose name and fame were household words, was gone forever! With what feelings the survivors looked upon the last act in this nautical drama, may be imagined. The rescued saved only the clothes which they stood in, everything else was swallowed up. The dark features of the picture are thrown out in strong relief by the noble conduct of all concerned, from captain to cabin-boy. No one was selfish for his own safety, but each one strove as only true men can exert themselves when the hour of danger is at hand. Honor imperishable to those heroes who thus deported themselves! When their names are made public, let them be assured that they will be as gratefully remembered by the people as were the services of the little *Monitor* whose untimely fate the nation now mourns.

VALUABLE RECEIPTS.

SOLDERS.—Soldering is the art of uniting the surfaces of metals together by partial fusion, and the insertion of an alloy between the edges, which is called solder, it being more fusible than the metals which it unites. Solders are distinguished as hard and soft, according to their difficulty of fusion. Hard solders usually melt only at a red heat, but soft solders fuse at lower temperatures. In applying solder it is of the utmost importance that the edges to be united should be chemically clean—free from oxide—and they should be protected from the air by some flux. The common fluxes used in soldering are borax, sal ammoniac, and rosin. Hard silver solder is composed of four parts of fine silver and one of copper, made into an alloy and rolled into sheets. It is quite difficult of fusion. Soft silver solder is composed of two parts of silver, one part of brass, and a little arsenic, which is added at the last moment in melting them. It will be understood that these alloys are commonly run into convenient bars or strips for use. Silver solders are used for soldering silver work, gold, steel, and gun-metal. A neater seam is produced with it than with soft solder. It is commonly fused with the blow-pipe. A strip of thin silver solder is laid on the joint to be closed, the blow-pipe is brought to bear upon it, when it melts and runs into the joint, filling it up completely. Button solder is employed to solder white metals, such as mixtures of copper and tin. It is composed of tin ten parts, copper six, brass four. The copper and brass are first melted, then the tin is added. When the whole is melted the mixture is stirred, then poured into cold water and granulated, then dried and lverized in a mortar for use. This is called gran lated solder. If two parts of zinc are added to this a loy it makes a more fusible solder. Fine gold cut into hreds is employed as a solder for joining the parts o chemical apparatus made of platinum. Copper cut i to shreds is used as a solder for iron. Hard silver s lders are frequently reduced to powder, and used in th condition. Soft solder consists of two parts of ti and one of lead. An excellent solder is made of eq parts of Banca tin and pure lead. It is used for soldering tin plate, and, if well made, it never fails.

Illustrated Lectures on Japan.

The distinguished Dr. Macgowan, who has resided and traveled for twenty-one years in the East and is very familiar with China and Japan, commenced a course of three lectures at the Cooper Institute, this city, on Thursday evening, the 8th inst. The second lecture was delivered on the 12th, and the third will be given on the 19th inst. The first lecture was on "Japan and its Productions;" the second was on its "Government and Religion;" the third will be on its "Arts, Literature and Customs." In illustration of his subjects, Dr. Macgowan exhibits splendid specimens of Japanese art, natural productions and many curiosities. As a lecturer his manner is pleasing and his descriptions vivid and interesting. Never before have our people been so favored to obtain reliable information respecting Japan and its peculiar people. Dr. Macgowan has no superior in knowledge of Chinese affairs; this, indeed, might be supposed, as he was editor of a newspaper published in the Chinese language, and his works on the electric telegraph and other scientific subjects in the Chinese language having been republished in Japan.

A Veteran Cotton Manufacturer.

A correspondent of the *Boston Journal* gives an interesting biography of Joshua Herrick, who is now a foreman on the great work by the United States progressing at Fort Scammell, in Portland harbor.

He worked in the first cotton mill put in operation in the United States, the machinery of which for carding and the preparation was propelled by horses, and the fine roping and spinning done by "billies" and "jennies" which went by hand; the weaving and the finishing of the goods were also done by hand. Mr. Herrick worked in the first cotton mill put in operation in Massachusetts, propelled by water, and tended the first breakers and finishers for carding cotton ever run in the United States; being informed at the time that the machines of Samuel Slater of Pawtucket, R. I., were of a different construction. Mr. Slater's mill was commenced in 1790. Mr. Herrick was overseer of the spinning-room in the first cotton mill put in operation in Maine, and overseer of the whole cotton department of the mill in Brunswick belonging to the Cotton and Woolen Manufacturing Company in 1815 and 1816.

Metals.

The imports of tin last year amounted to 35,000 slabs Straits; 24,600 Banca, and 375 tuns English, amounting altogether to 71,200 slabs, against 40,900 last year. At present there are 37,400 slabs on hand in Boston and New York. Banca is selling at 42 cents per pound; Straits at 40 cents; English at 38½ cents. The best refined English is not exported. There is a duty of 25 per cent on tin. The price at the beginning of 1862 was 28 cents per pound.

The price of copper is 31 cents per puund. The yield of Lake Superior copper for the year was about 15,000,000 pounds of ingot, of which there are 3,750,000 pounds on hand.

The price of lead is 8 cents per pound. About 36,200 tuns of this metal were imported last year. Galena received from the West 3,000 tuns. The great demand for this metal has been for the purposes of war. The stock on hand at New York is 5,200 tuns.

Spelter or crude zinc is 7½ cents per pound. About 1,400 tuns were imported in 1862; the domestic product was 1,600 tuns.

The imports of foreign bar iron for the past year amounted to 18,657 tuns; pig 12,884 tuns; bundles of sheet iron 363,095. The demand for American iron is so great that all the mills are now running busily. Pennsylvania pig is now selling at $30 and $32 per tun.

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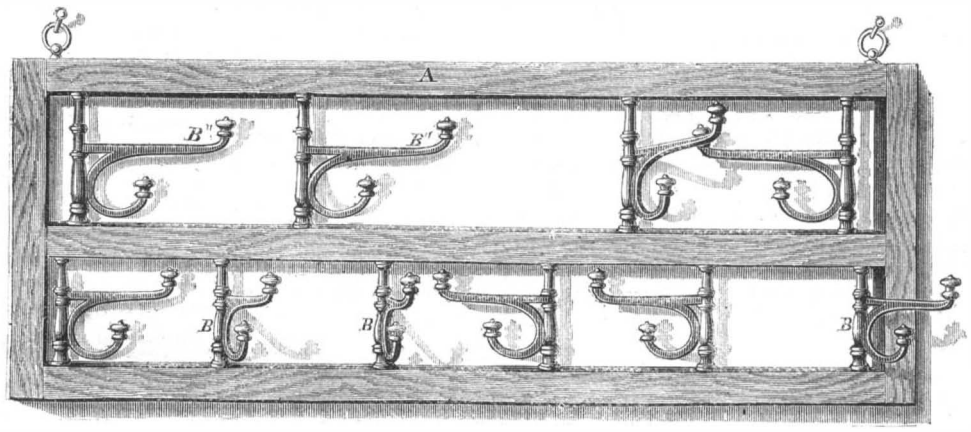
Improved P tent Hat and Clothes Rack.

We herewith ' ustrate a convenient and portable apparatus for suspending clothing, hats, or any article of apr rel which is usually disposed of in that way. It onsists of a rectangular frame, A, made of any orna ental wood, provided with two rings on its upp r e e, by which it is suspended from the wall. Whe not in use it can be removed at pleasure. The hoo or brackets, B, are erted in this frame and revolve upon their axes; they can be closed up entirely, if necessary, when not in use, in the manner shown in the one marked B″. Travelers will find this a very useful article when absent from the conveniences of home. Its appearance is neat and the uses to which it can be put will be apparent to all.

Patented Oct. 14, 1862, by J. O. Montignani, of Albany, N. Y. Apply to Peter M. Morange, assignee, of same place, for further information in regard to this hat and clothes rack.



MONTIGNANI'S PATENT HAT AND CLOTHES RACK.

TREATING AND FLAVORING TOBACCO.

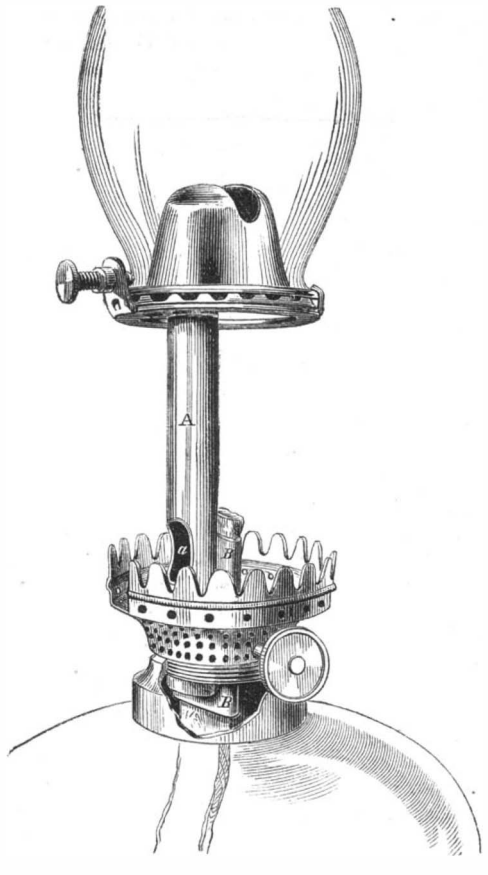
A very common opinion prevailed for a long period, that tobacco was a tropical plant and could not be cultivated in latitudes of moderate temperature. It is a fact, however, that it will grow and may be cultivated not only in all latitudes where corn or maize comes to maturity, but in regions much further North. Large crops of tobacco are now raised in the valley of the Connecticut, and the leaf of the plant is smooth and held to be well-suited for the wrappers of cigars. It is also cultivated in some portions of Albany and Ontario counties in New York, thus proving that the plant may thrive in our most Northern States. And not only may it be cultivated in such latitudes, but it is well known that soon after it was introduced from America into England it was cultivated for a period with success in several sections of that country, and also in Ireland. In 1570 it was grown in Yorkshire to a considerable extent, but its cultivation was prohibited by an act of Government, for the purpose of deriving a large revenue from that which was imported. This occurred during the period of the Commonwealth, in 1652, and since then not a leaf of tobacco, except as a curiosity, has been grown in England.

We have been told by those who are esteemed connoisseurs of tobacco, that although this plant grows luxuriantly, when properly treated, in the Northern States, still it is not equal to the qualities which are cultivated in warmer latitudes. This is perhaps owing to the mode by which it is treated, after it has matured. In Virginia, the sun-dried tobacco is held to be the best for chewing, but most of it is finally cured by artificial heat. Tobacco, in leaf, is very sensitive to moisture in the atmosphere, because it contains so much potash, common salt and lime. An analysis of this plant gave, potash, 8.7 per cent.; soda, 1.2; lime, 32.2; common salt, 3.8; magnesia, 2.8. In Richmond, which has been the head-quarters of the tobacco business, there are very extensive manufactories where the leaf is cured, and afterwards made into plugs for chewing. Great care and attention are necessary to the proper curing of it, and if the weather is moist during the operations it is very liable to mildew. In clear, dry weather it is spread on the tops of sheds, and hung in every situation where it can be exposed to the dry air. The sky is watched with anxiety during such exposure, so that it may not receive a drop of rain. Very frequently it receives its final drying in warm apartments, and in many cases these are heated with open fires, dry corn cobs being about the best fuel that can be used. Pine and some other woods impart their resinous taste to the tobacco, if the smoke is permitted to permeate through the leaves.

After tobacco is perfectly cured, it is prepared for pressing. It is now a common practice to flavor it with some mixture of a sweet and aromatic character. A common preparation is that of the tonqua bean, which has a pleasant odor. Vanilla is also used, and different manufacturers have their special mixtures. The leaves are spread out and slightly sprinkled with the aromatic liquid until a sufficient quantity of the moisture is absorbed to render them pliable, They are then rolled into cylindrical packages, and these are squeezed into flat plugs in powerful presses. A number of such plugs are subsequently placed together and subjected to a second pressing operation, by which the plugs are converted into blocks, and thus fitted for transport and market. It was formerly the custom to place the pressed tobacco in a room called the sweat-house, where it remained for a considerable period exposed to a warm atmosphere. This treatment made the tobacco sweat; globules of juice appeared upon its surface and dropped on the floor, and its taste was much improved thereby.

It is also common with some tobacco manufacturers to sweeten the dark and rank qualities for chewing by dipping the leaves in bunches into sugar sirup, before pressing them. We have only referred to the treatment of chewing tobacco; the superior qualities being used for this purpose. The terms "honey dew," "sweet leaf," &c., applied to different lots of tobacco, are of the "bunkum" order. The best qualities of tobacco are said to be cultivated on new soil, on the southern sides of gently sloping hills.

BAKER'S IMPROVED LAMP ATTACHMENT.



The improvements which have been originated in the kerosene-oil lamp are numerous and add greatly to its efficiency as an illuminator. We publish this week, for the benefit of our readers, an engraving of a convenient attachment to the lamp whereby it may be filled or trimmed without removing any part of it, thereby avoiding all burning of fingers by handling a hot chimney. The ordinary cap is supplied additionally with a semi-cylindrical tube, A, which has an opening, *a*, in its walls. This tube is guided in its upward or downward motion by the wick case, B, against which the lower part of it is seen resting at the base of the cap, part of which has been removed so as to expose the same to view. It will be apparent that, whenever it is necessary to trim the wick, or supply the lamp with oil, either of these operations can be performed by simply raising the chimney; the wick can then be bent on one side and cut, and the kerosene poured in through the aperture, *a*. This attachment is the invention of James R. Baker, of Kendallville, Ind., and was patented on June 24, 1862. Any further information in regard to it may be obtained by addressing him or the agent, Mr. Edwin Lisle, of the same town.

Emery Polishing Wheels.

Our London cotemporary, *Newton's Journal of Arts*, for December, contains an article on polishing tools, in which special attention is directed to a new kind of emery wheels for polishing metals. It states that the old emery wheels used by Sheffield cutlers for polishing steel, were made with emery mixed with glue and molasses, applied on the surface of leather. Such wheels could not be brought into contact with either water or oil. In 1858, F. Ransome patented a mixture of ground glass and emery, applied to grinding wheels with liquid silicate of soda. Such wheels have not met with much success. Emery wheels and polishing sticks, composed of a mixture of vulcanized india-rubber and emery, have been introduced into England from America, but their use has, as yet, been limited. The new emery wheels were secured by patent granted to Walter & Beard, in September, 1861. The substance of which they are composed consists of solidified linseed oil, brought to this condition by exposure to the air, and a quantity of shellac. This compound is mixed with emery while in a plastic state, and then molded into any form and size for polishing and grinding. Such emery wheels are employed for polishing steel and other metals, dry, and for grinding glass, slate and marble, wet. They are run at the rate of four thousand feet per minute; they do not clog, and they may be run until they are worn to the spindle. It will be understood that emery wheels are not employed for finished polishing, like "buffing wheels."

An "Automatic Eyeball."

An interesting contribution to medical science has just been made to the Royal London Ophthalmic Hospital. It consists of a most ingenious apparatus for exhibiting the muscular mechanism of the human eye, and is called the "automatic eyeball." It was sent by the inventor, Professor Hasner, of Prague, to the Austrian Court of the International Exhibition, and, at the close of the latter, presented to the above institution. The apparatus consists technically of a left eyeball, the movements of which are regulated by strings attached to keys, which are worked like the keys of a pianoforte. There is also a graduated dial attached, upon which, by means of indexes affixed to and moving with the strings, the extent of each muscular action is accurately marked. This simple contrivance thus exhibits, at a glance, the beautiful arrangement of the muscular structure of the eye, the knowledge of which, hitherto, could only be acquired by dissection or oral instruction. In short, the "automatic eyeball" performs for the exterior what the ophthalmoscope has already done for the interior of the eye.

Some excellent specimens of cotton, equal in quality to the Sea Island fiber, have been cultivated in Algeria.

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VOL. VIII, NO. 3....[NEW SERIES.]....*Nineteenth Year.*

NEW YORK, SATURDAY, JANUARY 17, 1863.

DWELLINGS FOR THE POOR.

In our last issue we adverted to a want which existed in regard to suitable houses for persons of moderate incomes. Although there are a large class of our people who earn fixed salaries, varying in amount from $600 to $6,000, there is a still larger number in the community who may be said to have no salary, and but little or no dependence for support except upon the strength of their muscles. These persons should also be provided for; they, too, should have homes and dwellings to which they can retire, and in which they may shield themselves from the biting blasts of winter or the fierce heats of summer. It is not taking extraordinary ground to say that the peace, welfare and stability of society depends in a great measure upon the condition of the poor. When they are properly housed, coal, donated by charitable societies, ceases to be in request; when their hunger—which they are unable, perhaps, from the force of circumstances to satisfy—is appeased, then soup houses are no longer in demand, and the beggar's knock at our door is seldom heard. In brief, when the indigent are able to care for themselves, then work-houses and pauper institutions generally decline and fall. Not only are these material matters to be considered, but there are also some other conditions which have a bearing upon the subject and assert their influence over it. We can advert to only one of these at this time, and that is the condition of the poorer quarters with reference to the tenements in them. The community generally has a vast responsibility in this particular, which is too often lost sight of in the hurry and bustle of money-getting and time-serving. Let us go through some of the streets on the east side of the city, and mark the nature of the buildings and their tenants, and also observe the surroundings of the same. What shall we see? A long row of houses, or rather walls dignified by this title, in every conceivable stage of squalid decay and wretchedness. Upon one side of every house is a gin-shop, and upon the other a beer-cellar, and these alternate for blocks with the stalls where stale fish, meat, vegetables and bad bread are vended. The gutters reek with miasma, the streets are foul with garbage and ashes—ascends to heaven a reeking steam, in hot weather, of foul gases, which are inhaled and respired by thousands of pairs of lungs, with what effect upon the physical system one can imagine. The scavengers are unknown there, but a sanitary commission might be, with the happiest results.

Now, let any reflecting person ask himself wath the effect of such associations is likely to be upon the people who are exposed to them. We cannot expect a model city—that would be unreasonable; neither can we hope to make people individually clean who never, perhaps, heard of such a thing in their lives. Something is due to the force of example. There are children continually gathering about the doors of these rum-shops, thronging in and out, tumbling around under foot, and haunting every unoccupied nook and corner. Not only do they play there, but they also drink there, they absorb the fumes of alcohol, they drink beer, they are stolid, stupid and profane. These are not the sons of Dives, but they are the children of Lazarus, the beggar. Girls learn paths from the frowzy, ragged, indolent men who lean against the door-posts, idle either from choice or necessity. They learn lewdness from the slatterns and drabs of women who, unkempt and half clad, join the men in their libations; or they gossip from open windows with others of their sex in similar conditions. To crown all, their days are spent in bickering and slandering their neighbors. Jews, Irish, Germans, Dutch, negroes, and representatives from all nations under the sun congregate together and impart their peculiar vices to each other. As we have previously remarked, we cannot expect perfection; upon the sun there are spots, and in every society and in all communities there are evils which cause uneasiness and anxiety, but they must not be left to cure themselves. In this case the medical maxim "nature is the strength of medicine," is of no avail. Abandoned in their squalor, the poor and vicious—for they are thrown together from necessity, not choice—innoculate each other until the whole mass is infected. The disease must be cauterized, and this cure can only be effectual by casting out the impure element from the pure one. Separate the honest poor from the vicious paupers. Provide dwellings for them where, at a moderate rent, they can enjoy such comfort, and above all cleanliness, which is akin to godliness, as their means will permit. That these things can be secured to them there is no manner of doubt. The houses must be warm, strong, and solid to their foundations. They must be fireproof, so that when fires break out, the inmates will not be roasted like rabbits in a burrow; and they must be thoroughly ventilated, and have conveniences for water and washing, which are not general, as also opportunities for drying clothes upon the roofs, when there is no room elsewhere. With these features, and wood-houses in the yards, or accommodations in the cellars for fuel, we can inaugurate a system of tenement houses which, like our public schools, shall be the pride of the country. The apartments might be and ought to be warmed by hot-air furnaces in the cellars, worked at the landlord's expense. This arrangement would be safe, clean and economical; a trifling addition to the rent would be a source of economy to the tenants, and an avenue of profit to the capitalist. The floors, doors, and stair-cases should be of iron, and then the second condition of the requirement would be satisfied, and the other features specified so provided for that the ends required would be subserved.

It is no fanciful picture that we have drawn of the condition of the poor in New York. Indeed, we cannot elaborate it half as much as it will admit of. There are strong points which we have left untouched, arguments and statistics which might be adduced, that would go to show how much the physical and mental welfare of society depends upon the worldly condition of the poor. But let us not prolong our article lest we weaken our cause. Although there are some model dwellings for the poor in this city, there are not half enough of them, neither are they in good neighborhoods. Only let capitalists invest their money in such dwellings as these, exact the rent beforehand if need be, and we are certain they will never have cause to regret it, if the scheme be properly managed.

MERCANTILE CONDITION OF OUR COUNTRY.

It may well surprise ourselves and all other nations that, during a year of the greatest civil war on record, our country in her productive and commercial interests has been wonderfully prosperous. There has been no commercial suffering, and want has been unfelt in the land. Compared with the year 1861; the business of last year was much better, and the number of mercantile failures was much less. Indeed it is a gratifying fact that the mercantile credit of our country was far more favorable than it had been for the six preceding years. Thus in 1857 the failures in the Northern States numbered 4,257, with $265,818,000 liabilities; in 1858, 3,113, liabilities, $73,608,747; 1859, 2,958, liabilities, $51,314,000; 1860, 2,733, liabilities, $61,739,474; 1861, 5,935, liabilities, $178,632,170; while in 1862 the number of failures was only 1,652, liabilities only $23,049,300. The repudiation of Southern debts in 1861 led to many disastrous failures in that year; but the recuperative energy of our manufacturers and merchants has been shown in a remarkable manner by the enterprise they have since displayed. Useful lessons of economy and discretion were taught them by former misfortunes. Business is now conducted very extensively upon a cash basis, and it may truly be asserted that the country, in a business sense, is in a prosperous condition. Capital is abundant at low rates of interest upon good security, and the elements of thrift and prosperity are evident on every hand. The great secret of our nation's wealth and strength lies in her superabundant natural products, developed by an industrious people. In this respect we stand first among the nations of the earth. A country which raises annually such immense crops of grain never can be poor. Business panics may occur occasionally, and the disasters of war may change the courses of manufacture and trade; but while the elements of true wealth remain, prosperity will always succeed disaster. It is true that nearly all articles of merchandise have greatly advanced in price; still there is employment for all, and it is an old business maxim, that "work and want do not fellowship together."

SUBTERRANEAN CITY RAILWAYS.

In order to relieve Broadway, in this city, from the great crowds of vehicles that almost choke it up daily, different kinds of railways have been proposed, and several of a suspension character for this purpose have been illustrated and described in former volumes of the SCIENTIFIC AMERICAN. It has generally been feared that such structures would disfigure that noble street, and thus the remedy would be worse than the evil intended to be overcome. A subterranean railway was also proposed several years ago with the same object in view, but it never received serious attention from the public. Perhaps it was thought generally to be a dark and impracticable subject; but be that the reason or not, such a project demands re-examination, as it has been demonstrated to be a practical success in London. The *Times* states that the new subterranean railway in the English metropolis is to run trains every ten minutes during the day, and the fares are to be lower than those of omnibuses. Working-men's trains are also to be run, morning and evening, for one penny fare per passenger. When the line is completed the whole intended length, its cost will be $6,500,000; but if a viaduct or suspended railway had been built, the cost would have been four times that amount, and it would have spoiled some of the most beautiful streets in London.

HOMES FOR SOLDIERS' ORPHANS.

An act was passed at the last session of Congress donating lands for the establishment of agricultural colleges in all the States. The amount of land donated to each State is no less than 30,000 acres to each representative. This act of Congress awaits the action of the Legislatures of the several States for acceptance, and the arrangement of measures to carry out its contemplated objects. In connection with these agricultural colleges, it has been proposed to associate, on the experimental farms, homes for the orphans of the patriot soldiers who have fallen in defense of the laws of their country. An association called "The Institute of Reward" has been formed to further such views, and it has rooms in the Bible House, this city—Dr. D. P. Holton being its secretary. This appears to be a rational and benevolent object, and we trust the Legislature of this State and those of others will mature measures at an early date for the establishment and practical operation of such institutions.

THE "DICTATOR."

We recently visited the Delamater Iron-works, at the foot of Thirteenth street, New York, where the U. S. (Ericsson) battery, *Dictator*, is now being built. The frame or ribs of the vessel were nearly all set up at the time of our visit; by this writing they are doubtless all in place. So far as we could judge, in the imperfect state of the ship, she will have very fine lines; her counter and run aft are very clear, and give promise of speed. A large force of men are busy upon her, and the sturdy blows on the hot rivets resounded from all sides. As we are restricted from publishing any important details of this battery, our readers will have to be satisfied with the following general particulars:—The *Dictator*

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is to be 320 feet in length, 50 feet in width, and will have 20 feet depth of hold; her engines are to have two upright cylinders of 100 inches diameter each, and 4 feet stroke of piston. The screw will be 21 feet and 6 inches in diameter; pitch, 32 feet; the boilers are six in number, three on each side, and are of the return tubular pattern.

The Delamater Works have, in addition to this vessel and her engine, a number of other orders which they are driving ahead as fast as possible. There are one pair of vertical engines whose cylinders are 36 inches diameter, by 36 inches stroke, worked by a boiler of 10 feet diameter of shell and 17 feet long, driving a screw of 11 feet diameter 17 feet pitch. These engines are for the Lake Erie trade. They are also constructing one of the same pattern for the Commercial Steamboat Company; and also two pair of engines each 20 inches diameter of cylinder, and 17 inches stroke, for C. S. Bushnell, New Haven, Conn.; screws 9 feet diameter, with 12 feet pitch. Also one pair of engines of 40 inches cylinder, by 12 inches stroke, *Monitor* pattern, for C. Mallory, Mystic, Connecticut. There are about one thousand men employed at present about the works.

STAMP-CANCELERS.

Since the publication of our last article on this subject (Scientific American, Vol. VII., page 406) we have been gratified by the hearty response which it has received from inventors throughout the country. It will be recollected by most of our readers that we declared our conviction that the canceler ought to conform to the manual operations with which the clerks employed in the post-offices were already familiar. It would seem that the majority of inventors are of this opinion also, as nearly all of the plans which have been submitted to us are constructed with that end in view. We are permitted by our correspondents to notice some of their plans and state our views with regard to them.

One very popular method of canceling the stamps which has been proposed, is to use the common hand punch, provided with a number of sharp points which shall enter the stamp in several places, and so perforate it that it cannot be removed in a sound condition. The same operation also impresses upon the letter beneath the date and place of mailing if desirable. The features of the mechanical apparatus by which it is proposed to accomplish this, are various, but they all amount to the same thing practically. The objection that we see in these cancelers is, that they are very liable to be injured and are expensive to construct and replace. The points must be inserted closely with relation to each other, and one blow upon a letter which contained any metallic substance would be sufficient to destroy the whole apparatus. This objection, we think, is a serious one.

Another plan, which has been submitted to us by at least a dozen different persons, is to have a thread underlying the postage stamp; this thread protrudes below the edge sufficiently far to allow of its being grasped by the fingers and ripped up through the postmark. This motion cuts it in two parts and destroys its value. The objection to this method is its expense; each thread must be attached separately, or else affixed only at the expense of time and labor. Either the stamps must be made singly or the threads applied separately or else tacked on in loops which should span the points of division in the sheets of stamps. Not only this, but the thread might be pulled off by any malicious person, thus creating no end of trouble. We do not think this method at all feasible.

Another inventor has proposed an apparatus consisting, as he says, of only one cutter, two springs, three gears for driving fly-wheels, and four fly-wheels for driving three or more circular saws to scratch off the surface of the postmark! The thought suggests itself that possibly a simpler combination than this might be devised. There are several of these cancelers very profitably employed at the present time in sawing boards.

Again, it is proposed by several correspondents to insert a number of small knife points in a circular form and give these a gyrating motion by mechanical means at the time of striking the blow with the punch. This looks like coming to the point. Such an apparatus, if properly made, that is, simple and strong, so that a blow would not break it or derange it, will, we think, be a useful instrument and perhaps work as long without repair as any machine that does similar work. In connection with this plan there is another one of similar design, which cuts out a piece, nearly the width of the stamp, by merely having the inner ring, which is on some city and town postmarks, made sharp so that it cuts into the paper and prevents the removal of the stamp in a sound condition. These methods have merit, they are simple and efficient, the last one especially so, and no objections exist against their adoption at present save those which will apply to the first plan mentioned in our article, namely, the danger of soon blunting the knives by rough usage. Paper is one of the most difficult articles to cut, without injury to the cutter; it is very close and firm in its texture, and a body of it, when struck smartly, resists a blow almost as much as a piece of wood of the same bulk. It must also be borne in mind that the usage to which a stamp-canceler is likely to be put is very severe indeed, especially in large offices where there are thousands of letters mailed daily; and inventors, before sending their plans and models, should be certain in their own minds that they will come up to the mark in this respect.

An indelible chemical ink has been proposed in connection with this subject, the canceling of stamps, and it would be the cheapest and simplest method of accomplishing the object, unless it is intended to impress the evidence of mailing on the letter itself. In many cases this would be undesirable.

It is remarkable to see how much ingenuity and real brain work has been, in most instances, given to this subject; and we doubt not that some of them, if properly worked out in detail, would prove of the greatest benefit to the country.

After writing the above, we find, on looking over our correspondence for the day, an additional number on the subject which claims our attention. The letters here alluded to relate, like many of their predecessors, to the employment of sharp points for perforating the stamp and letter; we have given our opinion elsewhere on this head. Among all the methods for subjecting the head of the "Father of his Country," or the benefactor of it, Franklin, to indignity, none perhaps is more peculiar than a proposition to burn them in effigy! This, the projector thinks, will most effectually prevent any evil-disposed person from making capital out of their remains. It is necessary, in this case, to have a small lamp burning in which to heat the brand employed, and the inventor thinks twenty seconds would be enough to heat it sufficiently. As this suggestion seems to be made in perfect good faith, we will inform our correspondent that in twenty seconds the mailing clerks would dispose of about fifty letters, and he will at once see that his improvement would be unavailable.

From our necessarily brief mention, our readers will see what has been proposed and what is required, and if some of our correspondents have been overlooked, they will consider it as unavoidable from the many letters we have received, and not an intentional neglect. It should be also borne in mind by those intending to lay out money upon their inventions, that no matter how great their intrinsic merits may be, they are wholly worthless as property unless adopted by the Government.

ARTILLERY EXPERIMENTS OF THE AMERICAN AND ENGLISH GOVERNMENTS.

It is important, in the present condition of the country, that no means should be left untried to perfect our defenses by land and sea. Iron-clad ships are projected and built, and go forth on duty with all their faults, if they have any, uncorrected; apparently but a very small part of the inventive genius of the country has had any hand in their construction. We know for a certainty that it is a difficult matter for any one without strong influence to gain a hearing from the officials at the heads of the several departments connected with the subject in question. What strikes us as being most singular, however, is the manner in which the ordnance experiments are carried on at Washington, as shown by the late report from that bureau. The last Congress appropriated the sum of $25,000 for the purpose of building targets which should represent sections of iron-clad vessels, heavily armored. These, as we understood the matter, were not to be confined to any one favorite plan, or controlled by one idea of the best method of making them, but were to represent, in short, the talent of the nation in devising some plan whereby the argument between artillery and armor should be effectually settled in one way or another, either by proving beyond question that no plating, however well designed or constructed, could prove efficacious or practical against shot, or that the guns themselves were unable to effect the destruction of iron-clad vessels. These views, as we have remarked, were the ones which we supposed Congress entertained when making the appropriation; how far they have been carried out may be seen by reading the report from the Ordnance Department. In our opinion there should be a radical change in conducting these experiments, so far as the interests of the public and inventors are concerned. If a financial provision has been made by a legislative body, in any State even, that money is the fund of the public and an account should be rendered for every cent of it. We want the actual results as regards the stability of the target, the particular form of it, its cost per pound, its backing, and its distance from the weapon. We want information concerning the kind of gun or guns which was or were used against the former, whether rifled or smooth-bored, their weight, their capacity for continued firing and resistance to rupture from the same. Also, in respect to the projectiles thrown by them, the public should be informed of their shape, size, weight and resistance to fracture when projected against armor; whether of cast-iron or steel-fronted, whether punch-pointed or flat headed, in short, we want all the technical details of the artillery practice which is carried on at the Government's expense. The people cannot otherwise arrive at any conclusion as to the propriety of multiplying forms and qualities of guns which may and have proved lacking in some qualities thus far, in practice of the kind referred to, that is, against iron-clad ships.

The English Government has tried experiments and has given the results of them to the world at large; we know what kind of target was riddled, as also the gun that delivered the missile which accomplished that result. Late English mails bring us accounts of target practice in that country, during which charges of from 50 to 75 lbs. of powder are said to have been fired from bores less than those from which we explode only 30 lbs. These are facts, and very weighty ones too. If powder represents power, and power is required for velocity, and this last quality is necessary to penetrate, smash or utterly destroy the defensive combinations of an enemy, then, so far, notwithstanding all our vaunted experiments and the windy ejaculations of the daily press, we say, notwithstanding all our progress, we are a year behind the age. Here are the facts according to the English authority:—Mr. Joseph Whitworth has pierced with his steel bolts, weighing 150 lbs., a target composed of 5 inches of iron, backed by 18 inches of teak wood, lined with an inside skin of $\frac{5}{8}$-inch iron; the velocity of the shot was 1,500 feet per second when it left the gun, and 1,220 feet per second when it struck the center of the 5-inch plate. The gun was a 120-pounder, fired with a charge of 27 pounds of powder, at a distance of 800 yards from the target. Also, a 70-pounder was fired with 13 lbs. of powder, at a distance of 600 yards; the steel shell weighed 81 lbs., and, upon striking a $4\frac{1}{2}$-inch plate, passed through it and burst inside. We have guns in this country which will perform better work than this if properly used. Why are they not brought into service? We are well aware, from the report of Capt. Dahlgren, that our 11-inch guns have been fired on occasions with charges of powder varying from 20 to 30 lbs., and that the 15-inch gun is said to have been tested with 50 lbs. of powder, but we would like to ask if these quantities are service charges, and if the artillery can be relied upon to perform practical, every-day work with them? We do not think any good end can be attained or the interests of the country subserved by snubbing our inventors and endeavoring to slight their productions; nothing is accomplished by this manner of treating them, nor will there ever be. Something, of course, must be at-

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tributed to disappointed pride and ambition, but it is a singular fact that all the proprietors of patents, as well as the projectors of plans, whether fortunate or unsuccessful, concur in saying that they have been thwarted, and had all sorts of obstacles laid in their way, while endeavoring to gain a hearing at the Ordnance Department. We are actuated by no other motive in giving these facts publicity than the welfare of the people's interests; that they are facts and can be proved we are well assured. Let us then have, from the Government officials, the reports of moneys expended by them for the purposes previously set forth, and let us also have impartial and fair trials of our inventions outside of the navy yards. We shall then soon display a bold and threatening front which will do more toward averting foreign intervention than all the diplomatic double-dealing of both hemispheres combined.

OUR RAILROADS.

We have noticed that in seasons which have been propitious for crops, the interior carrying trade of the country always prospered. This cause, combined with several others, tended greatly last year to the prosperity of all those railroads removed from scenes of warfare. Our country is much favored by nature for the operation of railroads, and the enterprise of our people has been wisely displayed in the construction of more lines than are to be found in any other country in proportion to the population. In the non-slaveholding States there are 21,185 miles completed; in the border slaveholding States there are 1,954 miles finished. These are owned by 425 companies, and their cost of construction and equipment amounted to $966,442,219. Prior to the commencement of our civil war, there were 9,294 miles of railroad completed in the Southern slaveholding States; but in Virginia and Tennessee, there was such a destruction of railroad property last year, that it is scarcely possible to give information as to the condition of railroads in those States, as well as others further south. It will be of general interest to know the length of lines belonging to each State. In Maine there are 489 miles completed; in New Hampshire, 659; Vermont, 554; Massachusetts, 1,281; Rhode Island, 99; and Connecticut, 620. In the State of New York there are 2,767 miles completed; in New Jersey, 689; Pennsylvania, 3,134; Delaware, 136; Maryland, 448; Ohio, 3,004; Michigan, 833; Indiana, 2,169; Kentucky, 531; Illinois, 3,003; Wisconsin, 970; Minnesota, 1,167 projected, but only six miles completed; Iowa, 796 completed; California, 70. In Kansas ten miles have been finished, and in Oregon three miles. These do not include city railroads. Much of the products of the great West, which previously were carried down the Mississippi to New Orleans, were conveyed eastward by railroad, last year, thus causing an enormous traffic on the great Northern and Eastern lines. On this account there has been a steady rise in the value of their shares, and an increase of dividends in all cases. The most extensive new railroad in progress is the Atlantic and Great Western, of which 205 miles are completed. It connects with the New York and Erie Railroad, passes through the northern part of Pennsylvania, thence into Ohio, and is in tended to be the most direct route to St. Louis. It will form a continuous chain with the Pacific Railroad—broad gage—and will ultimately form a line extending across our entire continent.

PLOW-HANDLES WANTED.

A correspondent from Pennsylvania writes as follows:—"If you know where a man could buy plow-handles ready bent, please to inform me through your paper. I think a manufacturer would do well to advertise them in the SCIENTIFIC AMERICAN."

We cannot give our correspondent the information he wants, but have no doubt some manufacturer will act upon his hint, and send us an advertisement. The SCIENTIFIC AMERICAN, as an advertising medium, cannot be surpassed in its particular department. We have have hitherto most good naturedly endeavored to answer all such inquires, and often through our columns, but we really cannot afford to give so much gratuitous advertising. Parties who thus seek to use our columns ought to be, and doubtless are, willing to pay for the space occupied.

OUR RECENT VICTORIES.

The New Year dawns auspiciously. Our armies under Rosecrans, on the Cumberland, and those under Gen. Sherman at Vicksburg, on the Mississippi, have won renown for themselves and the thanks of a greatful people. The long days of suspense that passed ere we heard from that brave general and soldier, Rosecrans, are over, and we can safely assume that the rebel army so lately before him are incapable of further mischief. The consequences of a rebel victory in this particular struggle would have been overwhelming to the Union cause. There is no question, but, with the re-occupation of Tennessee by the secessionists, the whole of that State would have risen against us, and that it would most speedily have organized a force, in connection with aid from Richmond, and advanced upon the Western cities. These would have been at their mercy; Gen. Grant would have been cut off in the Southwest from his connection with the North, and a series of complications inaugurated, which might have proved excessively disastrous to us. Through the rout of the rebels, through the dispersion of that hungry horde by Rosecrans, through this general's firm persistence, undaunted courage, and faithful reliance upon his men, and by the sturdy, indomitable prowess of our Western soldiers, we are able to announce that the tide has turned, and that victory is again ours. What though fatigue follows, and our forces are separated for a time, it is an honorable relaxation which supervenes when the fruits of our triumph are secured, and one that the nation will very willingly accord.

Again: in the destruction of the Virginia and East Tennessee railroad by Gen. Carter, the communication with Richmond southwardly, has been destroyed, never we hope to be resumed. One bridge which has been burnt on this line, at Union, Tennessee, is described as an extensive trestle-work, which would require at least ninety days to rebuild. This is a serious matter, especially as the remains of the rebel army defeated by Rosecrans are supposed to be retreating by this very route. Their feelings may be conceived when they arrive at Union and behold their progress suddenly delayed.

So also at Vicksburgh, if we may believe rebel reports, we are now in possession of that place. The importance of holding it is great; and Gen. Sherman, his officers and soldiers, will, when their reports reach us, show that they too deserve well of their country. The rise in the Mississippi is said to be exerting its influence on the Vicksburgh canal, filling it rapidly, and the prospect is that the town will soon be four miles inland. Thus does this year open; from the Southwest and West, the armies advance to the fray, they meet, they engage, and the rebels discomfited and worsted, flee, and are heard of no more. Even as Gideon smote the Midianites and Syrians that advanced against him, so also our generals scatter those who venture to confront them. That it may be always so is our earnest hope. All hail, then, to the glad New Year!

GENERAL HALLECK.

Persistent efforts are being made by a small portion of the newspaper press, and also by a class of fault-finding quasi-friends of the Government, to disparage the General-in-chief of our armies, General Halleck. Those who lend themselves to this sort of work are usually systematic fault-finders, and if their own favorites and their own wise plans are not accepted by the Goverment, they leave no devices or means unused to heap contempt upon those who chance "to come betwixt the wind and their nobility." We hope none of our readers will lend themselves to aid the schemes of these disorganizers. General Halleck is unquestionably a man of profound ability, and is doing his utmost to carry on the most gigantic military movements ever entrusted to the direction of one mind; and we do not allow ourselves for one moment to distrust either his loyal devotion to the cause, or his ability to direct such movements as will result in giving glory and success to our arms. War at best is a great game of chance, and a slight mistake on the part of the commanding field-officer might lead to disaster. General Halleck's plans, however wisely conceived, might be frustrated by a combination of events over which he could personally exercise no control. It is unwise, it is wrong, it is in a great degree unpatriotic, to seek to cast odium upon this high officer for any seeming failure to crush out the rebellion at all points, and as speedily as we might personally desire. The General-in-chief will, we are well persuaded, do his best to win success; and instead of heaping blame upon him for all failures, we should do all in our power to support him. If General Halleck is not competent to the great work assigned to him, where shall we look for a successor against whom envy and malice will not operate to thwart his plans? General Halleck managed the details of the Western Department with consummate skill, and we have heard even his enemies from that section declare that his management in Missouri was marked with great ability. If it so happens that we personally admire another general, we should not allow our likes and dislikes to weigh against unqualified devotion to the Government and country, which need all our aid and support in this alarming crisis.

TRIAL OF THE "MONTAUK" AT SEA.

This vessel left this port on December 24th, in tow of the steamer *Connecticut*, her engines working slowly so as to keep the strain off the tow-line, as well as to ease them up before going into active service. The everlasting "foaming," of which we hear so much in connection with the boilers of these batteries, seems not to have been wanting on this occasion. After the second day, says the *Herald's* correspondent, this trouble ceased, and the engines performed creditably. The *Montauk* remained in tow of the *Connecticut* until her arrival off Cape Henry lighthouse; her hawser was then thrown overboard, and she steamed into the harbor alone. The engines made sixty-four revolutions per minute with thirty pounds of steam, driving the ship at the rate of eight and a half knots per hour. The *Montauk* attracted the notice of a great many persons as she steamed along, and favorable inferences were drawn of her future from her present performance. The turret was worked during the trip, and the guns handled, all to the satisfaction of those in charge. Captain Worden, who gained such wide renown while in charge of the *Monitor*, on the occasion of her ever-memorable contest with the *Merrimac* in Hampton Roads, has charge of the *Montauk*, and we shall doubtless hear a good report, in more senses than one, when he brings her big guns to bear upon the enemy. That he may do this speedily is our earnest prayer. The *Passaic*, which, as we are informed on the best authority, carried away a great many of her boiler braces on her first trip out, has been repaired, and is now lying at some point on the Southern coast, ready for service.

GAS IN SMALL TOWNS.

Light is gradually breaking in upon our people in regard to the cardinal points of domestic economy; these are cleanliness, cheapness and simplicity, in all the household arrangements. We are glad to see the adoption in families of such machines as clothes-wringers, small cider-mills and corn-mills, washing-machines, patent churns; and a host of other inventions which tend to lessen the severity of human labor. Sometimes the greatest opposition is experienced in the introduction of new systems, no matter how beneficial they may be to the mass. We have an example of this in the case of Mr. C. J. Van Gorder, of Warren, Ohio, one of our patrons for many years. This gentleman, conceiving it to be his duty to provide a better illumination for his fellow-townsmen, actually went to work and erected a coal gas manufactory, without any other knowledge of the process than that which he has derived from reading the various articles relating to it published from time to time in the SCIENTIFIC AMERICAN. His experience in overcoming obstacles and local prejudices has been no exception to the general rule, but he has the satisfaction of having triumphed over all of them, both material and mental, and the pleasure of seeing his scheme in successful operation, and his work appreciated by his townsmen.

THE *Great Eastern* sailed for Liverpool from Flushing Bay, on Saturday the 3d inst., with 150 passengers and a fair cargo of breadstuffs and provisions.

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THE SPHERE OF WOMAN.

Much has been written, sung and spoken upon the assumed incapacity of woman to take care of herself. Conventions and meetings have been held and dissolved, all bearing upon this subject. How far the solution of the question has been aided by those long-haired and astonishing-hat-wearing gentry, who seem to spring suddenly into being during the excitement attendant upon women's conventions, is a matter which is somewhat difficult to solve. We know, however, that avenues of business are opening, and branches of the trades that were hitherto closed are being discovered, in which the superior patience and natural delicacy of touch of the feebler sex are beginning to be appreciated. At all events, the old and senseless twaddle about confining females to the home circle and the nursery is being daily refuted by the most cogent of all possible arguments, namely, their ability to maintain themselves and oth ers honorably, outside of that secluded nook. If the sex in question are to be confined to the locality just mentioned, it would be necessary to suppose them either all wives or else attendant, in one capacity or another, upon them. Besides, supposing some, by the chances of life, to be thrown out of shelter and home, what are the philosophers and wise-acres going to do for them? Clearly, they must be provided for in another way, *i. e.*, they must be taught how to provide for themselves.

The great social evil, which has for years attracted the attention of the noblest members of both sexes, which has put philanthropists and moralists generally to sore straits, may be nearer a favorable solution at the present time than many of those persons who have endeavored to subdue its extension could have hoped for.

We are brought to these reflections by the perusal of a little volume containing a record of 500 and upward different callings, professions and trades, which have been and are being followed by women. This book is also compiled by a woman, Miss Virginia Penny; and in a quaint, matter-of-fact sort of way the authoress records, in brief, the opinions of those persons with whom she consulted in reference to the fitness of their callings for the female sex. A notice of this work appeared on page 11 of the present volume of the Scientific American. We append a synopsis of a few professions which have been tried and found remunerative by women, which we think will be instructive:—

Miscellaneous Designers.—Designing is a peculiar and more a natural than a cultivated talent. A few years ago, Miss M. drew on stone for the New England Glass Company. She received $10 a page, which she could generally do in four days, working only four hours per day. Two men had at different times done the work for the company, one receiving less and the other more than she. Misses L. and R. drew and designed in the carpet factory at Lowell. They received $1 25 per day. A young lady who designed at the Pacific mills, in Lawrence, was said to receive $3 per day. Miss S., who had given but eighteen months' practice to drawing, designed for ground and painted glass, and received $6 per week. Designs for toys, dissected pictures, games, puzzles' &c., are an appropriate filling-up of spare moments for a designer. I was told by an English seller of embroideries, that, in England, designing and making patterns for embroideries is a distinct business. He has been at it many years and does not feel himself perfect yet. It is not made a distinct branch in this country yet, because there is not enough of it done. Here a few primary patterns can be arranged and re-arranged so as to answer all the demands of trade. A great deal of money is expended on monuments, but there is a want of variety in the designs. A wide field is here opened to operators in this department. Some designers in Boston write me:—"Only a few ladies are employed in our business, for there are not many who are willing to devote the time necessary to become proficient. Some are employed in Europe. The employment is not more unhealthy than sewing. Women are paid according to their proficiency, and earn from $3 to $15 per week. Women receive the same compensation as men, if they do the work as well and as fast, but they ordinarily cannot do either. They are not paid until they have spent two or three years in learning. A combination of artistic and mechanical talent is required. The prospect for employment is good. There is not much variation in the seasons for work. Ten hours is the average time required. There are now as many in the business as can find lucrative or constant employment. It requires not less than five years, generally more, to be a fair general workman in this business. Boston, New York and Philadelphia are about the only places where there is a demand for designers. A first-class education and cultivated taste are absolutely necessary to success."

Designers for Calico Prints.—This employment is well adapted to women. It requires taste and ingenuity. Its labors are light, but rather confining. A person of lively fancy and nice powers of discrimination succeeds best. The gay, rich, dark colors of winter clothing are not suitable for summer; nor are the light, delicate ones of summer suitable for winter clothing. This inviting field of labor, now that it is unbarred to women, we hope will be well improved. Let her enter, and she will find sufficient to "reward a careful gleaner with a valuable sheaf or two." We do not speak of inventing and preparing designs for calico prints particularly, but of the general field for designers. Some proprietors engage a designer (here and there a lady) to stay at their establishments, and devote all their time to the preparing of designs—paying a fixed salary for the month, year, or any time specified. Some adopt the same in wall-paper establishments. The price generally paid for a design pattern for calicoes is from $1 to $3.

Patterns.—In large cities there is a constant call for a supply of new patterns; consequently stores are kept for the purpose of cutting and selling them. A dress and cloak-making establishment is frequently connected with them. The sale of patterns to dress and cloak-makers in the South and West is considerable—greater, perhaps, than that in the city. T., and Mme. D., are the leaders of this branch in New York. Mme. D. has in pattern-making mostly young girls. A large room of young girls requires but two or three ladies to assist and direct. It takes but little time to learn. She does not pay until they have learned, and then pays young girls $1 a week and upward. T., son of the editor of the *Bon Ton*, told me their fashion magazines have a circulation of three thousand, mostly among miliners and dress-makers. The plates are colored in Paris. Leslie's and Godey's plates are colored in this country. T. takes six French publications devoted to the fashions. They look over plates and select such styles as they think will be popular. They have a lady in Paris who writes to them from there, describing the fashions. They employ a lady in connection with their pattern-making who, by looking at the plates, is able to cut out a mantle, sleeve, &c., exactly like the plates. Some ladies could never learn to do so. They employ ladies, both in pattern-cutting and dress-making, and pay from $3 to $5 per week—to a competent forewoman $10 and $15. Women are paid small wages while learning. Their business is advancing—has advanced most during the last few years. Their trade is Eastern, Western and Southern—mostly Southern. Their girls are employed from 8 A. M. to 6 P. M.; having an hour at noon. In the pattern business there are just about enough of hands in New York. Spring and fall are the busy seasons. E. G. says the busy season commences the middle of January, when she is willing to receive learners. She gives instruction for nothing for one month; after that she pays $2 50 a week, if successful, and continues to increase the salary according to the abilities of the individual. A good hand can earn $5 per week, working ten hours a day. Another lady told me that in pattern-making she gives instructions two months, paying nothing, but then they can earn $2 50, and, as they become more expert, can earn $3, 3 50 and $4. They are paid by the week, and it would be impossible to pay by the piece. It requires practice to become an expert cutter. She prefers for pattern-cutting, young girls from twelve to fifteen years old. In large cities, some women go around to cut patterns, sell stays, embroidery, &c.

We may add in conclusion that the greater part of the Scientific American is set up by female compositors, and their work will compare most favorably in point of accuracy with that of men. In deciphering dubious manuscript they are certainly skillful; we are sometimes accused of penning characters compared to which those of Rufus Choate were as legible as copper-plate, and it is a little singular that most of the complaints on this head come from men employed in the office.

A Brave Engineer.

George D—— was running the night express, and was some thirty minutes behind time. My freight train was waiting on the switch for him to pass. He came on at about thirty-five miles an hour, as near as I can judge, and I was watching him all the time. He was within about three times the length of the switch—was blowing the whistle—when I saw and he saw the switchman run madly out of his shanty, grab the switch and turn it so that it would run him directly in the rear of my train. I jumped, instinctively, to start my engine—I heard him whistle for brakes, and those that stood near said that he reversed his engine—but my train was too heavy for me to move quickly, and he was too near to do much good by reversing, so I soon felt a heavy concussion, and knew that he had struck hard, for, at the other end of 45 cars, it knocked me down, and the jar broke my engine loose from the train. He might have jumped from his engine with comparative safety, after he saw the switch changed, for the ground was sandy there and free from obstructions, and he could easily have jumped clear of the track and escaped with slight bruises. But, no! Behind him, trusting to him, and resting in comparative security, were hundreds to whom life was as dear as to him; his post was at the head; to the great law of self-preservation, that most people put first in their code of practice, his firm duty required him to forswear allegiance, and to act on the principle, "others first, myself afterwards!" So, with a bravery of heart such as is seldom found in other ranks of men, he stuck to his iron steed, transformed then into the white steed of death, and spent the last energies of his life, the strength of his last pulse, striving to mitigate the suffering which would follow the collision.

His death was instantaneous; he had no time for regrets at leaving life and the friends he loved so dearly. When we found him, one hand grasped the throttle, his engine was reversed, and with the other hand he still held on to the handle of the sand-box lever. The whole middle and lower portion of his body was crushed, but his head and arms were untouched, and his face still wore a resolute expression, such as must have lit up the countenance of Arnold Winkelried, when crying, "Make way for liberty!" he threw himself upon a sheaf of Austrian spears, and broke the column of his enemies.—*Exchange.*

A Million and a Billion.

We are perpetually hearing of millions, and of how many millions it would require to do this or that. We have a good idea what a million of dollars will do, but we very much doubt whether one person in a thousand has a correct idea of the quantity or number contained in a million. For instance, if you would ask a person how long it would occupy him to put down a million dots with a pen upon a sheet of paper, he will generally tell you something so far from the fact as to be laughable. Permit us therefore to say, for we have tried the experiment more than once, that it would occupy an expert penman about 14 days supposing him to work bank hours (that is six), incessantly, doing nothing but putting dots on the paper or dipping his pen in the ink. This will give our readers some idea of the quantity or number contained in a million. Let one try it, by laying his watch on the table close to the paper, and work for ten or twenty minutes, then add and multiply.

But what is a million compared to a billion? It is a mere nothing. What then, is a billion? A very short answer will suffice for a very long story. It is a million times a million. But who could count it? No man! A quick bank-teller can count one hundred and sixty or seventy a minute; but let us suppose he could go as far as 200. Then one hour will produce 12,000, a day 288,000, and a year (or 365 days) 105, 120,000. Let us suppose, now, that Adam at the beginning of his existence had begun to count, had continued to do so, and was counting still, he would not now, according to the usually supposed age of our globe, have counted near enough; for, to count a billion he would require 9,520 years, 34 days, 5 hours and 20 minutes. Now supposing we were to allow poor Adam 12 hours daily for rest, eating and sleeping, he would need 19,024 years, 60 days, 10 hours and 40 minutes.—*Investigator.*

Consumption of Tea in the World.

The following figures show the present annual consumption of tea, approximately, or as near as can be arrived at:—

	lbs.
China	1,408,000,000
United Kingdom	78,000,000
British America and West Indies	3,000,000
Australia, the Cape, &c	7,000,000
British India	3,000,000
United States	35,000,000
Russia	15,000,000
France	550,000
Hanse Towns, &c	150,000
Holland and its Colonies	3,200,000
Belgium	200,000
Denmark, Sweden and Norway	250,000
Germany	500,000
Spain and Portugal	200,000
Italy	50,000
South America	500,000
Other places	500,000
	1,555,100,000

The immense traffic in tea is one of the most remarkable illustrations of the enterprise and energy of modern commerce. The trade in tea now gives employment to upwards of 60,000 tuns of British shipping, and about £10,000,000 sterling of British capital, producing a revenue to the State of £5,500,000 sterling. Of all foreign imports, tea is the most important in Russia, and the whole of this comes to the fair of Nijnie Novgorod, with the exception of the very small quantity of sea-borne tea which is brought to Odessa. The middling classes make a more frequent use of this beverage than the rest. The declared official value of the tea introduced into Russia is about £1,500,000 sterling.—*London Grocer.*

A silver United States half-dollar was sold at auction the other day in Charleston, S. C., for $1 45, and a gold dollar for $3 15, "paper currency."

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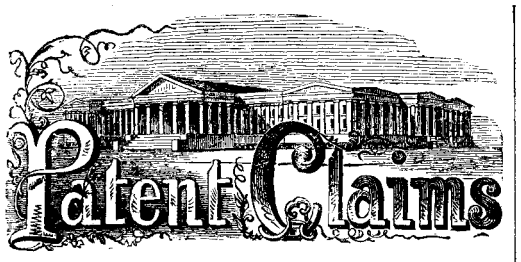


ISSUED FROM THE UNITED STATES PATENT OFFICE

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

The lists of claims for the weeks ending December 30th and January 6th, had not been received at this office at the hour of sending the SCIENTIFIC AMERICAN to press. We are very sorry not to have either of these lists to publish this week; and can account for the official omission to furnish them only on the ground that the officers were absent from their desks during the holidays. We shall probably receive the claims for the past two weeks in time to publish them in our next issue.

DISCOVERIES AND INVENTIONS ABROAD.

The following are some of the more useful of the foreign discoveries and inventions recently patented in Europe :—

Safety Friction Match.—The following is a condensed description of a mode of making safety friction matches, for which a patent has been obtained by M. Mearing, London. The wooden splints are first dipped into melted sulphur, and then coated with this mixture :—Chlorate of potash, eight parts; sulphur, one part; rotten-stone, four parts; gum, two parts; and lamp-black one part; all mixed in a sufficient quantity of water to form a paste. After being dipped they are then dried, but will not ignite until rubbed upon paper made as follows :—Take amorphous phosphorus, four parts; powdered graphite, one part; and form a paste with these in four parts of water and one of silicate of soda. This, when dried, is the paper upon which the matches prepared as described are rubbed.

New Kind of Leather.—A short process of treating hides, with the use of very little tan bark, to make leather, has been patented by H. C. Jennings, London. In the preparation of thick ox-hides by this process, the hair is first removed in the usual manner, either by steeping them in lime-baths, as in the old mode, or by sweating, according to the common American method. If lime is used, the hides are steeped in dilute muriatic acid, after they are unhaired and washed. This opens their pores and fits them for the succeeding operations. They are now piled in batches of a dozen hides in each, with a hurdle of wicker between each pair; and they are then alternately lowered into tanks filled with the following solutions :—Tank No. 1 is charged with a strong solution of alum, to which ten per cent. each of sulphuric and muriatic acids are added. Tank No. 2 is charged with a concentrated solution of soda-ash (carbonate of soda) to which is added five per cent. of the tungstate of soda. The skins or hides are immersed for six hours at a time in these tanks, then withdrawn and drained, and transferred alternately from the first to the second, and *vice versa*, until the hide is sufficiently hardened. This condition of the hide is known by cutting a small piece off one with a knife. At this stage they are immersed for six hours in a strong solution of the tungstate of soda, alone; then lifted, drained and placed in a liquor of soap, made by dissolving 20lbs of soap in every ten gallons of water, and the hides agitated in this until the strength of the soap is exhausted by being absorbed in the hides. They are then washed well in soft water, and finally steeped for twenty-four hours in a common liquor of oak-bark, after which they are dried and finished in the usual manner.

Solid Drawn Gun Barrel.—The London *Mechanics' Magazine* states that Messrs. Christoph, Harding, & Hawksworth have secured a patent for drawing solid gun barrels cold by means of the hydrostatic press. It says :—"About ten pounds of steel are now used in making the barrel of an Enfield rifle, and when finished it only weighs four and three-quarter pounds, five and one-fourth pounds being wasted in the manufacture. By the new method, two rifle barrels can be drawn from ten pounds of metal, and they are equal in every respect to those made by the old system."

Diamond Drill.—The *Cosmos* relates that a diamond drill is now employed in France for drilling granite for blasting purposes. It says :—"A tube is fitted with a circular cutter of diamonds, and it is made to revolve as it enters the stone, and it thus scoopes out a circular hole. In hard granite, a hole 47 millimeters in diameter and 1.20 meters deep, for blasting purposes, has been thus bored in one hour, and the diamonds, when examined through a magnifying glass, did not seem to be injured."

Making Twisted Metal Tubes.—A patent has been taken out for manufacturing twisted brass and copper tubes, by J. T. Grice, Birmingham, England. A straight tube is first filled with pitch, or with lead, and one end of it is secured in a holding tool, and the other end rotated; or both ends may be rotated, but in contrary directions. In this manner the helical twist is given to the tube; after which the yielding filling material inside is melted out over a fire. The use of a yielding material inside of the tube when it is being twisted, is to prevent the tube from collapsing. As the surface of such tubes is untouched by this mode of operation, its surface may have been previously ornamented, without being subsequently injured. A hard mandrel, of smaller diameter than the bore of the tube, may also be used as a substitute for the yielding material, and the same end effected.

Preserving Ship Timber.—W. Clark, London, has taken out a patent based upon the invention of M. de Lapperent, of the French navy, for treating ship timber, to render it more durable. The timber is first steeped in soft water, which removes the sap; then it is dried and seasoned. The timber is then charred upon its surface by jets of gas, either when in its position in a ship, or when it is shaped. Below the water line of a vessel a paint is applied, composed of flowers of sulphur, two hundred parts; linseed oil, one hundred and thirty-five parts; and boiled linseed oil and manganese, thirty parts. It is stated that the odor of this paint prevents not only the formation of fungi on the timber, but barnacle incrustations also.

What a Western Inventor Says.

Mr. C. E. Steller, formerly of Genesee Station, Wis., but now residing at Milwaukee, writes to us as follows, under date of Dec. 29, 1862 :—

MESSRS. MUNN & CO. :—I have received your favor of the 23d inst., notifying me that my patent on a Seed-sower (the third one on my combined machine) has been allowed. I am very thankful for your efforts to bring these three cases to a successful result. You have attained all I had applied for, and more than I expected. I thankfully acknowledge the able and satisfactory manner, in which you have transacted my business with the Patent Office, and whatever I may have again to do in obtaining patents I shall place with full confidence into your hands. Further experiments with my machine, this fall, have proved that the main features protected by my claims are a perfect success.

We thank Mr. Steller for his complimentary testimonial, and we are happy to hear that experiments have proved his machine to be a "perfect success." When laborers are so scarce, consequent upon the war, all kinds of machinery, which reduces the burden of laboring men, are important and find ready sales.

WHAT A CALIFORNIAN SAYS.

Just as we had written the above paragraph we received the annexed letter, the perusal of which will benefit every inventor who is thinking of preparing his own application :—

MESSRS. MUNN & CO. :—The Letters Patent for my improved Spirit Level came to hand on the 6th inst. I am very much gratified by the success of my first undertaking in producing something new in the mechanical arts; and I thank you for the prominent part you took in obtaining that result. I was asked, before I sent you the model, why I did not send direct to the Patent Office, so as to save extra cost. My reply was this :—"I do not know how to prepare my case." I would not prepare my own application if I had a hundred designs; I possess no experience to make out patent documents properly. I would therefore recommend any and all who have occasion to make applications to the Patent Office, to do so through your Agency. Your excellent and inestimable journal comes to hand very regularly; I intend soon to get up a club, which I can do without much trouble.

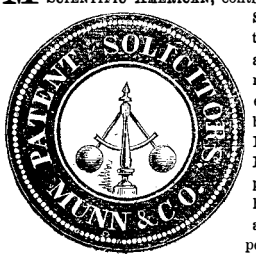
THOMAS N. HOSMER.

Todd's Valley, Cal., Dec. 11, 1862.

IMPORTANT TO INVENTORS.

PATENTS FOR SEVENTEEN YEARS.

MESSRS. MUNN & CO., PROPRIETORS OF THE SCIENTIFIC AMERICAN, continue to solicit patents in the United States and all foreign countries, on the most reasonable terms. They also attend to various other departments of business pertaining to patents, such as Extensions, Appeals before the United States Court. Interferences, Opinions relative to Infringements, &c. The long experience Messrs. MUNN & Co. have had in preparing Specifications and Drawings, has rendered them perfectly conversant with the mode of doing business at the United States Patent Office, and with the greater part of the inventions which have been patented. Information concerning the patentability of inventions is freely given, without charge, on sending a model or drawing and description to this office.



THE EXAMINATION OF INVENTIONS.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a written reply, corresponding with the facts, is promptly sent free of charge. Address MUNN & CO., No. 37 Park Row, New York.

PRELIMINARY EXAMINATIONS AT THE PATENT OFFICE.

The service we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a patent, &c., made up and mailed to the inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh streets, Washington, by experienced and competent persons. Many thousands such examinations have been made through this office. Address MUNN & CO., No. 37 Park Row, New York.

HOW TO MAKE AN APPLICATION FOR A PATENT.

Every applicant for a patent must furnish a model of his invention if susceptible of one; or, if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them and sent, with the Government fees, by express. The express charge should be pre-paid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of MUNN & CO. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank-bills by mail, having the letter registered by the postmaster. Address MUNN & CO., No. 37 Park Row, New York.

The revised Patent Laws, enacted by Congress on the 2d of March, 1861, are now in full force, and prove to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the Government fee required on filing an application for a patent is *reduced* from **$30** down to **$15**. Other changes in the fees are also made as follows :—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, excepting natives of such countries as discriminate against citizens of the United States—thus allowing Austrian, French, Belgian, English, Russian, Spanish and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (but in cases of designs) on the above terms. Foreigners cannot secure their inventions by filing a caveat; to citizens only is this privilege accorded.

During the last seventeen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN; and as an evidence of the confidence reposed in our Agency by the inventors throughout the country, we would state that we have acted as agents for at least TWENTY THOUSAND inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of inventors and patentees, at home and abroad. Thousands of inventors for whom we have taken out patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the inventors whose patents were secured through this office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive offices, and we are prepared to attend to patent business of all kinds in the quickest time and on the most liberal terms.

CAVEATS.

Persons desiring to file a caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention. The Government fee for a caveat, under the new law, is $10. A pamphlet of advice regarding applications for patents and caveats, printed in English and German, is furnished gratis on application by mail. Address MUNN & CO., No. 37 Park Row, New York.

ASSIGNMENTS OF PATENTS.

Assignments of patents, and agreements between patentees and manufacturers are carefully prepared and placed upon the records at

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the Patent O . Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park Row, New York.

It would require many columns to detail all the ways in which inventors or patentees may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park Row, New York, where any questions regarding the rights of patentees will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park Row, New York.

REJECTED APPLICATIONS.

We are prepared to undertake the investigation and prosecution of rejected cases on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief story of the case, inclosing the official letters, &c.

FOREIGN PATENTS.

We are very extensively engaged in the preparation and securing of patents in the various European countries. For the transaction of this business we have offices at Nos. 66 Chancery lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through the Scientific American Patent Agency, No. 37 Park Row, New York.

Inventors will do well to bear in mind that the English law does not limit the issue of patents to inventors. Any one can take out a patent there.

Circulars of information concerning the proper course to be pursued in obtaining patents in foreign countries through our Agency, the requirements of different Government Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park Row, New York, or any of our branch offices.

Home Queries

A. W. B., of Pa.—Brass wire and brass in thin strips are used for soldering iron. Borax is placed upon the joint to be soldered with the brass, and a blow-pipe is used for small articles. Steel is soldered with silver solder, composed of 2 parts of silver, 1 part of brass wire and ¾ part of arsenic, which is added last. We cannot tell you whose wind-wheel is the most powerful. There is one illustrated on page 241, Vol. II (new series) of the SCIENTIFIC AMERICAN, and three in Vol. XIV (old series). Volumes IV and V can be supplied at $2 25 each. We regret we are not able to furnish you with the other numbers you desire.

T. E. T., of Ohio.—You can get a steel boiler and a magnet made at the Novelty Works, this city.

M. E., of Pa.—We cannot answer your question positively unless we know what the conditions are which cause your wall to leak. Davison, of Williamsburgh, L. I., makes a water-proof paint which would answer your purpose.

H. H. F., of N. Y.—A liquid blacking for boots and shoes is made by adding ivory-black to gum-shellac dissolved in alcohol; this is expensive and not very good for leather. Another receipt is to take common paste blacking and dissolve it in alcohol; this requires friction to produce polish, the first does not.

E. S. S., of N. Y.—The durability of a walk or path made from water lime or hydraulic cement mixed with gravel, and also the relative cheapness of it would depend in a great measure upon how much of it is used. We presume that you wish to have a smooth, hard surface. No more cement should be used than what is actually required to set the gravel. You can find out the proportion by trying a little at a time better than we can give it to you. Thanks for your attention about the subscribers.

H. B., of N. Y.—Hardinge's process and apparatus for the manufacture of liquid quartz are both patented. The chloride of calcium is made by dissolving chalk or marble in hydrochloric (muriatic) acid. A concentrated solution of the chloride of calcium is evaporated, and its crystals obtained. These when fused at a red heat produce anhydrous chloride of calcium which has such an affinity for moisture that it is used for drying gases. It must be kept in well-stoppered bottles.

J. S. M., of N. Y.—No stamp-canceler should be employed which will operate as a cutter or punch. Reason why:—It is now common to send photographs, *cartes de visites*, fine lace patterns and a thousand tender and delicate articles in letters. These would be mutilated by cutting and punching cancelers, and thus one of the most useful and beneficial operations of the post-office destroyed. A good chemical ink is the most feasible canceler. Isinglass is only used for refining wine that is turbid. Dissolve the isinglass in water and stir it among the wine, when it will cause a sediment to fall to the bottom of the barrel and the wine will become clear. Isinglass answers a similar purpose for clarifying coffee. The white of eggs is equally efficacious when employed for clarifying liquors.

E. M. of N. Y.—Articles rendered water-proof with a liquor of alum and sugar-of-lead neither feel so pleasant or look so well as before being prepared. This is one objection to their use. The sugar-of-lead and alum may be dissolved in separate vessels in five minutes, and then mixed together, and allowed to settle. Whenever the sediment falls to the bottom of the vessel the clear liquor may be poured off and the cloth immersed in it for fifteen minutes, then dried. By this mode, as you observe, the white powder on the surface of the cloth will be avoided.

W. S. M., of Pa.—The number of "square inches" of water for a breast or overshot wheel is no data to guide us in giving an answer. The power to drive a wheel is in proportion to the quantity of water and perpendicular hight of the fall. Six cubic feet of water falling per second on a 20-foot fall would be about equal to 10-horse power on a wheel, allowing one-third loss for friction. We cannot give you the answer requested about the Warren turbine.

E. H. J., of R. I.—To make gun cotton it should be freed from grease, then immersed in a mixture of equal parts of nitric acid (specific gravity of 1·50) and sulphuric acid (specific gravity 1·80). After being saturated for a short period and it has assumed a white opaque appearance and lost its elasticity, it is lifted from the acid, placed in a porcelain cullender and washed under a stream of water until all traces of acid, when tasted, have disappeared. If the nitric acid be as weak as 1·36 specific gravity, the cotton will be converted into a gelatinous mass. Your failure in making it is perhaps due to the use of dilute or impure acids. It is stated, that if this cotton is washed in a saturated solution of niter, its explosive properties are improved. Dry it on frames in a warm apartment.

R. B. Jr., of Mass.—You ask for an explanation of the phenomenon of ice shooting out in needles from the sides to the center of a basin containing water, when the latter commences to freeze. Water obeys the laws of crystallization in the formation of ice, by commencing to solidify at the points of lowest temperature, such as the sides of vessels and the shores of rivers. Has it ever appeared to you more wonderful that water should ever become solid, than that it should solidify in a certain manner? Water obeys two laws in cooling. As its temperature cools it becomes more dense and heavy and sinks from the surface towards the bottom until it reaches 40° Fah., when it becomes lighter, expands, looses its heat and becomes solid at the surface, thus retaining the water at a higher temperature underneath its icy cover. If such a law did not prevail in the cooling of water, our rivers and lakes would freeze from the bottom upward and become such masses of ice in winter that our summers could not thaw them, and this portion of the globe would be uninhabitable.

L. M., of Ohio.—To tin the interior of cast-iron vessels they are first scoured bright with sand and dilute sulphuric acid, then washed in water and dried. Each vessel is then placed over a fire, heated and some powdered rosin sprinkled over the interior surface. Some pure grain tin is then placed inside, and when melted it is rubbed over the entire surface, with a thick pad of cloth, until a uniform coating of tin is laid on. Several vessels may be undergoing operation at the same time—the attendant operating upon each in rotation. As soon as a vessel is coated it is lifted from the fire and allowed to cool slowly. Copper vessels may be tinned in the same manner.

C. M. H., of Pa.—In the manufacture of potato starch a dark-colored slime gathers on the surface which must be scraped off. In order to manufacture such starch you must use proper apparatus, a knowledge of which you can only obtain by a visit to a well-arranged starch manufactory. Rain water generally contains the ova of insects, but there are no animalculæ in distilled water. Communicate with any of the proprietors of the knitting machines that have been illustrated and described in the SCIENTIFIC AMERICAN and you will be informed respecting their prices.

N. C., of Mich.—The substances from which paper can be made are innumerable, and the down of the swamp, "cat-tail," which you have forwarded to us, may be rendered useful for this purpose if mixed with some stronger fiber. We have been informed that in a paper-mill in New Jersey a portion of this substance has been used successfully as a mixture with swamp grass fiber, which has been employed for making coarse paper.

J. P., of Fla.—We have no confidence in what is called the "divining" or mineral rod which is supposed to indicate the presence of the valuable metals, such as gold and silver, under water or buried in the earth. Charlatans have pretended that they could tell where treasures were buried by the use of such agencies, but such quackery is opposed to all science.

J. B., of Ill.—Quite a number of machines for breaking and cleaning flax have been patented. You will find the one of A. H. Caryl, of Sandusky, Ohio, illustrated on page 393, Vol. IX (old series) SCIENTIFIC AMERICAN. The flax brakes which are employed in Ireland, where the flax manufacture is carried on most extensively, are described in Ure's Dictionary. These consist of fluted draw rollers made of red beach, and operated either by steam or water power.

L. E., of Wis.—A very combustible pyrophorus is made by calcining an intimate mixture of 15 parts of lampblack, 1 part of powdered black lead and 27 parts of the sulphate of potash. In powder it forms a shower of sparks when thrown into the air. The method of manufacturing oxygen gas from nitrate of soda is described on page 386 of our last volume (7th of the new series).

W. H., of Ill.—Very little has been made public respecting the modes of making sugar from the juice of sorghum. We have examined several good specimens of sorghum sugar, which were obtained by adding a small quantity of freshly slacked lime to the newly expressed juice, then evaporating it in successive pans until it was sufficiently concentrated. A brief description of this process was given on page 329, Vol. VI (new series) of the SCIENTIFIC AMERICAN. Some of our readers who have been successful in making sorghum sugar may communicate their processes, for the benefit of the public, through our columns.

C. B., of Conn.—You may make hydraulic cement drain tubes, using a smooth stick for a core, taking care that the core is coated with varnish so that it may be easily drawn out when the cement sets.

J. N. H., of Mich.—If the quantity of steel filings obtained from the sharpening of saws in your mill is large, it would pay to save them and re-melt them in a crucible. It is scarcely worth the trouble to save them, as you suggest, for fire-works, because the quantity required for such purposes is small.

C. H. B., of Miss.—The caps are put on by hand by girls. The caps are dampened, stretched over and tied.

H. C. G., of Wis.—The *Daniel Drew* made the trip from New York to Albany in 1860 in 6 hours and 50 minutes; tide favorable, wind fresh ahead. The distance is estimated generally at 100 miles.

Money Received

At the Scientific American Office on account of Patent Office business, from Wednesday, December 31, 1862, to Wednesday, January 7, 1863:—

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Improved Wind Wheel.

A very useful class of motors are those which are operated by the wind. On large prairies, and in flat countries where the natural face of the country does not permit the use of water wheels except limitedly, they will be found particularly useful, and they have been in constant use near our sea-coasts for many years. The wind wheel we herewith illustrate has some very desirable features which we shall proceed to notice. The structure, A, shown in Fig. 1, carries the wheel, B, on its top; this wheel, the fans of which project toward the reader, is secured to the shaft, C, which revolves in suitable bearings, and from which the power is transmitted. The semi-circular case, D, is provided with an offset arm, E, which runs down to the wooden platform, F, running around the tower; attached to this arm are the iron brace-rods, *a*, which are jointed at one end,

Fig. 1

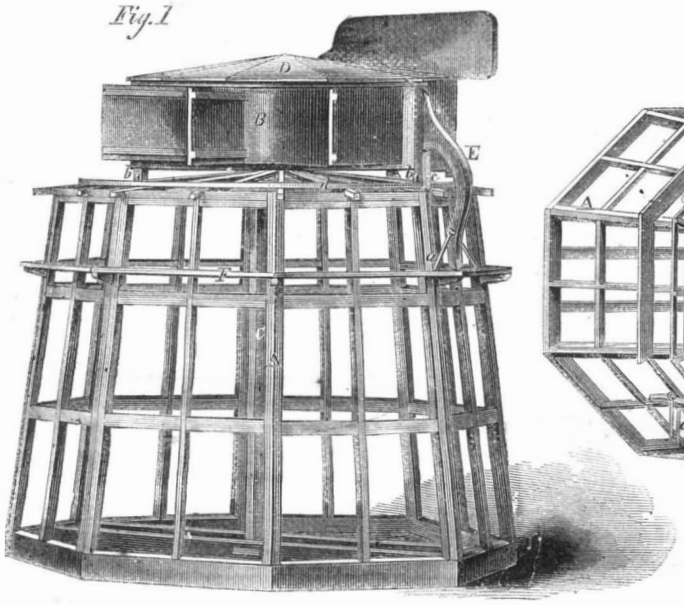
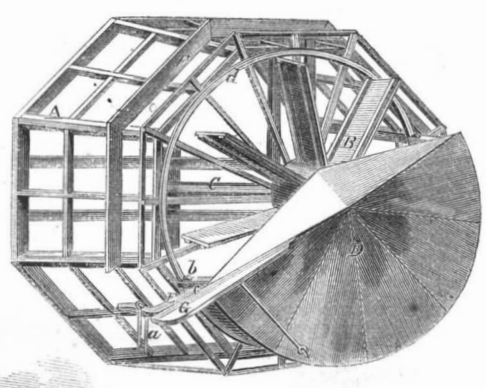


Fig. 2



KOEHLER AND REICHARDT'S WIND WHEEL.

and sharp at the other. In connection with these, is the vane, G. This case constitutes the peculiar feature of the invention, and by it the wheel can be readily controlled as to its action; as for example: supposing the speed of the wind to be far beyond that at which it is desirable the mill should rotate, it is only necessary, in order to obviate this, to withdraw the braces, *a*, from their place, and revolve the case, D, on its rollers, *b*, so that the fans of the wheel are shielded from the violence of the gale. Or should the reverse be the case; the semi-circular covering can be so disposed as to allow the wind to act on all the surfaces that it can usefully. The case or shield, D, is also provided with appendages, *c*, that catch under a horizontal way, *d*, on which the shield rotates. Fig. 2, shows a top elevation of the invention, in which the parts are marked with similar letters of reference.

The vane is also provided with a hinge so as to keep it in such a relative position with the buckets that the wind shall exert the most favorable influence upon them. This invention was patented through the Scientific American Patent Agency, Oct. 14, 1862, by Messrs. John W. Koehler and Frederick Reichardt, of Decatur, Ill. Further information may be obtained by addressing them as above.

The Translation of the Rain.

As the rain falls heavily on the roof, it speaks manifold things, and this is the translation:—"My errand is life. I have roused the sleeping streams; they leap from the rocks and tear down through the chasm, roaring and foaming, and proclaiming wealth and prosperity to man. I have my hoary companion on the mountain tops, who will not yield up his treasures until wooed by the summer sun; I, answering the prayer of thirsty earth, am here. I will smite on the cabin-roof and wake the sleeper to labor; I will beat the window-pane and rouse the debtor from his stupified despair. Gathering my forces I will turn them against the hills and unearth treasures that make the veins and arteries and the heart of commerce pulsate with fever. My power shall be felt by every kingdom, from the jewelled queen to the Lazarus by the wayside. I will send messengers of joy to the dwellers by the Missouri and the Kenebec, the Solway and the Shannon, the Rhine and the Loire, and the tawny people of pagan lands. I will make the heart of emperors swell with pride and ambition or tremble with fear, as golden levers shake their thrones. I quicken the cold blood of the miser, as he adds to his store, and answer to the widow, who cries in her desolation for bread. I sharpen the settler's ax, and send him further into the forest, and temper the plowshare for ground that is unsubdued. I will have a voice in the council of nations, and when empires and republics are weighed, I will even the balance; and then I will freight the rivers and seas with ships, some to gather the moss of the world's waters, and some to wreck against the icebergs of Arctic seas. Oh what a heaven-sent monarch am I! My scepter is gold, my empire is the world, my subjects everywhere, my power infinite, my reign ages of ages! But gently! To the quiet sleeper, peace; to the sinking and despondent heart, hope and joy; to wives and children, raiment and bread; to deserted fathers and mothers, the return of their prodigal sons; to waiting maidens, the embraces of strong arms and the kisses of lips unpolluted by untruth; and to God the gratitude of all!"—*Exchange.*

A Great Montgolfier Balloon.

M. Godard, the celebrated French aeronaut, has recently constructed an immense balloon of 4,300 metres. The car is provided with an apparatus which enables the aeronaut to ascend without either gas or ballast, and to descend or go higher up at pleasure. This apparatus consists of a kind of stove formed by three cylinders, separated from each other by insulating substances, whereby all danger of fire is averted. The flame is completely under the control of the aerial traveler, and is prevented from rising too high by a cap of wire gauze. M. Godard asserts that he can inflate his balloon in thirty minutes, and load it with from 600 to 800 kilogrammes over and above the weight of his person and his accessories; and, moreover, that his balloon may be pierced with a bombshell without endangering the aeronaut, who can himself cast projectiles of any kind with impunity. Should this new invention succeed, this balloon may be of considerable service in time of war.

Ventilation.

Typhus and putrid fevers, consumption, scrofula, delicate health, headaches, and cutaneous, billious, and nervous attacks are caused by inspiring vitiated air. About one-fourth of the annual deaths in Great Britain are caused by consumption, and nothing so soon diseases the lungs as inhaling vitiated air. God has decreed that a certain portion of oxygen shall suffice for the æration of only a fixed and determinate quantity of venous blood. If we adapt our circumstances to this law, we reap our reward in comfort and health; whereas if we transgress it, and persevere in breathing an atmosphere containing less than the requisite quantity of oxygen, and more than the usual quantity of carbonic acid, we have no more right to expect to enjoy health, energy, activity of mind and body, than to expect a fire to burn without air or a fish to live out of water.—*Dr. Combe's Principles of Physiology.*

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FOR 1863

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FROM THE STEAM PRESS OF JOHN A GRAY

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